Indiannica Learning
Knowledge beyond horizons

SMARTBYTE

A Course in Computer Science

Book 8

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Series Editor
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Developed in partnership with **VARCO Global**

Indiannica Learning Private Limited,
a subsidiary of Navneet Education Limited
New Delhi, India

Published in India by
Indiannica Learning Private Limited,
a subsidiary of Navneet Education Limited.
A-41, Mohan Cooperative Industrial Estate, Main Mathura Road, New Delhi 110044

First Published 2019
Third Impression 2020

ISBN: 978-93-88411-02-8

Printed in India by .....

Preface

Tell me and I forget. Teach me and I remember. Involve me and I learn.

— Benjamin Franklin

To enable children learn with ease, it's important to involve them and make learning enjoyable. It is often felt that children nowadays are tech-savvy (or rather gadget-savvy). But at the same time, we need to also ensure that they become familiar with the know-how of the technology. **SmartByte**, a new course in computer science designed for classes 1 to 8, lets them learn the concepts behind the technology and apply them. To make learning more engaging, it seamlessly integrates other subjects with computer science. It has a learner-centric practice-oriented approach and includes up-to-date developments.

The course emphasizes on the tools and their uses which will help learners explore, comprehend, and apply rather than the user-manual approach followed in most computer science books. It covers open-source software programs, such as Tux Paint, Scratch, Python, GIMP, and Synfig, to provide children ample scope to experiment with computer programs.

The salient features of the course are as follows:

- **Remember**—a simple fact that learners should remember
- **Quick Tip**—an alternative or short method to do an activity
- **Did You Know**—an additional piece of information related to a topic
- **Checkpoint**—in-text questions to assess the learner's understanding
- **Quick Learn**—a short activity linking a concept to its application
- **Key Terms**—end-of-chapter list of important terms
- **Project**—cross-curricular linked projects
- **Lab Activity**—provides learners with hands-on practice
- **Explore More**—gives learners opportunities to go beyond the textbook
- **Notes for the Teacher**—useful tips for the educator

The course is supplemented with comprehensive **teacher's manuals** with teaching aids to facilitate classroom transactions. Further, an easy-to-use **learning app** provides children support material and gives them instant access to learning and assessment resources.

I sincerely hope the course will help children assimilate the concepts with ease and make learning of computer science enjoyable.

—Bhavana Pandey

Key Features

A useful, simple fact that learners should remember

Remember

A program written in a programming language is called source code. The translated machine-language program is called object code.

Did You Know?

Describing an algorithm using an informal way that does not require any programming language syntax is called pseudocode.

An additional piece of information related to a topic

An alternative or short method to do an activity

Quick Learn

Open the Script mode and display your name using the print command. Also, save the program on your desktop.

A short activity linking a concept to its application

Quick Tip

If you want to draw straight lines with the Pencil (or any of several other paint tools), click at the starting point, then hold down the Shift key, and click at the ending point.

Checkpoint

Answer the following questions.

1. You are a programmer. Which language will you prefer to write a program?
2. What do you mean by ‘machine code’?
3. What was the need for translator programs?
4. Programs written in low-level languages need no translators. Then why do we need high-level languages, which require translators?
5. Which language is more hardware dependent—assembly language or high-level language? Explain how.

In-text questions to assess learners’ understanding

Key Terms

Data Sorting	Arrangement of the given data according to a particular field, either in ascending or descending order
Data Filtering	A quick and easy way to find and work with a subset of data that meets specific criteria
Custom Filtering	To apply multiple conditions to filter data
Conditional Formatting	Applying formatting based on the conditions given by the user

List of important terms

Application-based Questions

1. Neha has added a video clip to her presentation, and she wants to do the following tasks:
   i) Play the video continuously till she stops it on her own
   ii) Start the video automatically
   Help her in doing the tasks, and write the options she should use in each case.

Assignments to check the application of the concepts taught

Lab Activity

1. Create a presentation on global climate change. Collect data and add charts to show climate change in India over the past few years.
2. Create a presentation on the digestive system. Add animation and transition effects wherever possible. You can also add your recorded voice to the slide to explain the function of each part.

Enhances learning by doing

Project

1. Think about how computer languages evolved. Discuss in class.
2. You visited a bank with your uncle. He deposited some money in his account. Write an algorithm, and then draw a flow chart representing the steps followed. Write the input, processing, and output in these steps.
3. Write an algorithm to create the sieve of Eratosthenes.
   (The sieve of Eratosthenes is a method of finding prime and composite numbers from 1 to 100.)

Encourages application of concepts in real-life situations and links computer science with other subjects

Useful tips for the teacher

Notes for the Teacher

- Help students to try out the different ways to copy and move data.
- Demonstrate all the methods to select cells, rows, and columns.
- Discuss the use of the Flash Fill and Auto Fill features. Describe how these are useful in saving time and effort.
- Format the worksheet properly. Do not use too many formatting features.

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Contents

1 Computer Networking

After going through this chapter, you will be able to—

- **define** computer networking;
- **list** the basic components of a computer network; and
- **access** a file in the shared drive.

It is the time for the computer period. All students of class 8 are sitting in the computer lab. Akshara notices that there is only one printer in her lab. All computers are connected to that printer and any user (a person using the computer) can take a printout.

Akshara goes to her computer teacher, Ms Aradhana Raman, and asks her how one printer can take print commands from more than one computer. Ms Raman tells Akshara that this is possible through computer networking. She then explains the concept of computer network to the class.

What is a Computer Network?

Ms Raman tells the class that a computer network is a collection of computers that are interconnected for the purpose of sharing data and resources. This allows computers to communicate with each other and the devices. Through a computer network, it is possible to share hardware, software, and data. The connections between the computers and other devices are established either using the cables (wires) or through the wireless medium.

Advantages of Networking

The class now knows what a computer network is. Ms Raman lists down and explains the advantages of computer networking.

Easy data sharing

Computer networking has made it easy to share useful information instantly. Nowadays, data can be shared by a number of users. A network drive is used for storing and sharing data and taking backups. Thus, there is

no need to store data on each user's computer. (A network drive is a type of computer drive that is installed and operated over a computer network.)

Easy access to data

Data stored on a local storage device may be lost if the device gets corrupted and no backup has been made. Sometimes, the local storage space may not be enough to store data. Thus, storing data on a network storage area (centralized storage space) addresses these problems.

Cost-effectiveness

Using a computer network allows us to share hardware devices, such as printers, modems, and scanners, which reduces the overall cost of the hardware.

No need to keep hard copies of documents

In a computer network, we share soft copies of documents, which has reduced the need for keeping hard copies of documents.

Networking Components

'How is a computer network created, Ma'am?' asks Saloni.

'For establishing a network between a group of computers, a few components are required. Let us discuss some of the hardware devices one by one,' says Ms Raman.

Network Interface Card (NIC)

A network interface card (NIC), also known as a network adapter, is attached to a computer motherboard to enable the computer to connect to a network and receive data from other computers. Most computers today come with inbuilt network cards. The most commonly used network card is the Ethernet network card.

Modem

A modem (modulator-demodulator) is a device that enables a computer to exchange data with other computers through a basic telephone line. It converts the digital signals generated by a computer into analogue signals that the telephone line can transmit. These analogue signals are transmitted over a telephone line, and the receiving modem converts them into digital signals.

Fig. 1.1 Modem

Hub

A hub is a simple device that has multiple ports and can connect several devices to it. A hub cannot determine where to send information. It transmits any data that it receives to all its ports and network segments, regardless of the destination of the data.

The broadcasting of all information to multiple ports poses a security risk and can cause bottlenecks in a network transmission.

Hubs were popular earlier as they were less expensive than switches and routers. But nowadays, switches and routers are popular because of their efficiency.

Fig. 1.2 Network hub

Switch

A switch also connects computers to each other like a hub. But unlike a hub, a switch sends data to only the destination device or port in the network. It determines how and where the data is to be broadcast. As a result, the bandwidth (the amount of data transmitted in a given time) is not shared with other network devices. This makes a network more efficient. For this reason, switches are usually preferred to hubs.

Fig. 1.3 Network switch

Repeater

A repeater is a device that allows the signals to travel longer distances over a network. When a signal travels over a long distance, it may get distorted or degraded. A repeater regenerates the signal and then retransmits the signal.

Fig. 1.4 Repeater

Remember

A switch is a smart hub. It maintains a table containing the addresses of the computers it sends data to. It remembers the addresses of the machines attached to it.

Router

A router is used to route data based on their addresses. It is also used to form larger networks by connecting two or more networks. It performs more functions than a hub. While transferring data between computers or network devices, a hub does not analyze data. A router, on the other hand, can analyze the data transmitted over a network, change how it is packaged, and send it to either a different part of a network or a different network altogether. Some examples of routers used in a large network are brouter, core router, EdgeRouter, and virtual router.

Fig. 1.5 Router

Bridge

A bridge is a device that connects two LANs or two segments of the same LAN. The connected LANs can be similar or dissimilar. Unlike routers, bridges forward data without analyzing and re-routing it. Thus, these are faster than routers.

Gateway

A gateway is like a passage that connects networks, which use different protocols. They also convert data from one format to another.

Types of Computer Networks

Ms Raman now tells the class that there are various types of computer networks depending on their sizes and functions. She lists these types of networks—

- Personal area network (PAN)
- Local area network (LAN)
- Metropolitan area network (MAN)
- Wide area network (WAN)

Personal Area Network (PAN)

A PAN is a network of personal devices equipped to handle networking within a limited area. It handles the interconnection of the devices, such as laptops, mobile phones, personal digital assistants (PDAs), and smartphones, within the surroundings of a single user.

Remember

A PAN is a network centred around one person, while a LAN serves multiple users.

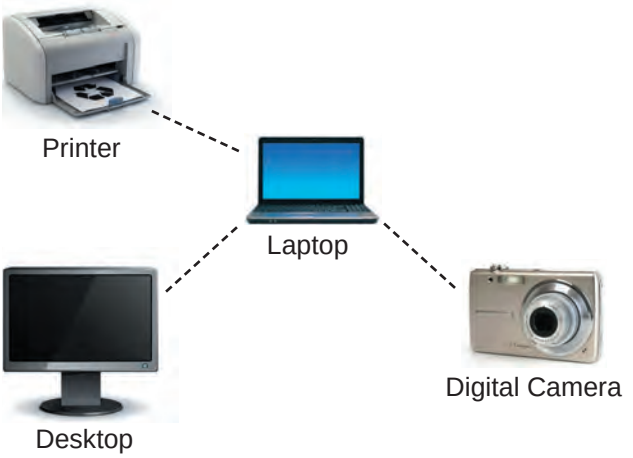


Fig. 1.6 Personal area network

Local Area Network (LAN)

A local area network is the basic building block of any computer network. It is restricted to a small geographic area, typically within a building. The smallest LAN may comprise only two computers, while a larger LAN can contain thousands of computers.

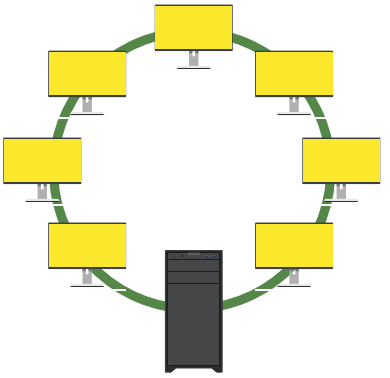


Fig. 1.7 Local area network

Metropolitan Area Network (MAN)

A metropolitan area network is larger than a LAN. It generally spans across multiple buildings of large companies, school campuses, cities, or towns.

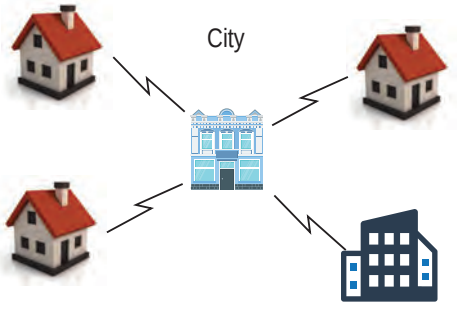


Fig. 1.8 Metropolitan area network

Wide Area Network (WAN)

A wide area network has no geographic limit. It can connect computers and other devices located at distant places. An example of a WAN is the internet, which connects millions of people all over the world.

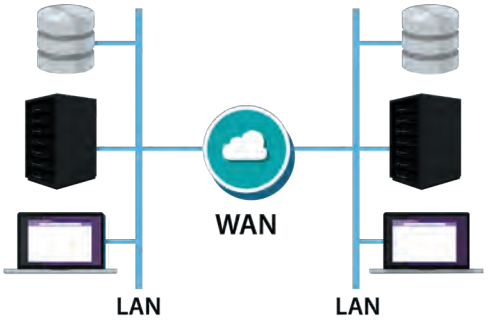


Fig. 1.9 Wide area network

Checkpoint

Answer the following questions.

1. List the advantages of networking.
2. Which of the following components is a centralized machine?
   a) Server b) Router
   c) Hub d) Switch
3. What is the difference between a WAN and a LAN?
4. Which type of network is the internet?
   a) LAN b) MAN
   c) WAN d) PAN

Network Topology

Ms Raman now explains network topology to the class. The term 'network topology' refers to the way in which different devices are arranged—physically or logically—in a network. A physical topology is a physical arrangement of different nodes (connection points within a network), workstations, and cables in a network, while a logical topology defines the way in which the information flows between various components of a network.

Major network topologies are bus, star, ring, mesh, and tree topologies.

Did You Know?

The basic type of network topology in which exactly two devices are connected back to back with a cable is called the point-to-point topology. It is usually used when the devices in a network are near each other.

Bus Topology

In the bus topology, each computer and device of the network is connected to one main cable. This cable is known as the 'backbone'. In this type of network, one of the computers acts as a server. A server is a computer that processes the requests and delivers data to other computers.

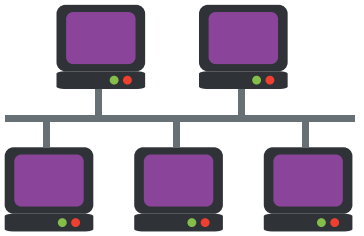


Fig. 1.10 Bus topology

Advantages of bus topology

- In a bus topology, it is easy to connect or add a computer or peripheral device.
- If a node breaks, it does not affect the entire network.
- As the cable requirement in a bus topology is less than that in a star topology, it is less expensive as compared to other types of topologies.

Disadvantages of bus topology

- If the main cable breaks, the entire network shuts down.
- It is difficult to repair a network in a bus topology, and that's why it is not suitable for large networks.

Star Topology

In a star topology, each computer and device is connected to a central server, called a hub, through a point-to-point connection. The devices in the star topology can communicate with each other only through the hub.

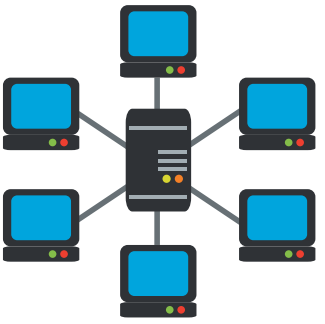


Fig. 1.11 Star topology

Advantages of star topology

- The start-up costs are low.
- It is easy to add new nodes to the network.
- Failure of connection between a computer and the hub does not affect other connections.

Disadvantages of star topology

- If the central hub fails, the entire network shuts down.
- As the cable requirement is more than the bus topology, it is more expensive.

Ring Topology

In a ring topology, the computers in a network are connected in a ring-like structure, and data travels in one direction. Each device is connected to its immediate neighbouring devices—one on the left and other on the right—and the signal usually travels in one direction through a single pathway until it reaches the final destination.

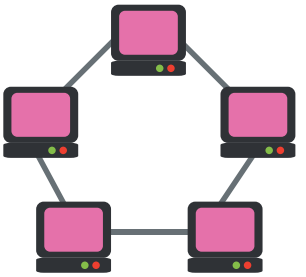


Fig. 1.12 Ring topology

Advantages of ring topology

- In a ring topology, it is easy to detect faults in case there is a problem in the network.
- In a ring topology, as each computer in the network can transmit data, it is capable of handling a heavy flow of data over long distances.

Disadvantages of ring topology

- It is difficult to add a device to this type of network.
- If a computer in the network fails, the entire network shuts down.
- Wiring in a ring topology is costly.

Mesh Topology

In a mesh topology, every device is connected to every other device. Each node has a dedicated point-to-point connection to every other node. Thus, there is more than one path between two nodes.

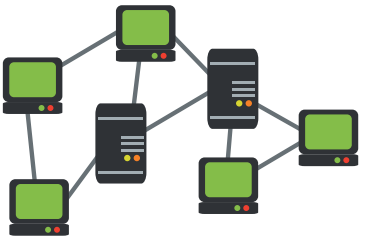


Fig. 1.13 Mesh topology

Advantages of mesh topology

- Failure of one connection does not affect the entire network.
- It can handle a high volume of data traffic.
- As data travels through dedicated connections, security is quite high.

Disadvantages of mesh topology

- It has a very high cabling cost.
- Installing a network in a mesh topology and reconfiguring it is difficult as each device has to be connected to every other device.

Tree Topology

In a tree topology, there is only one connection between two nodes. It is also known as a star–bus topology as it consists of the elements of both the star and bus topologies. There is a central hub, also known as a root node, at the top, which is connected to one or more other nodes below it. These nodes are also connected to one or more other nodes below them.

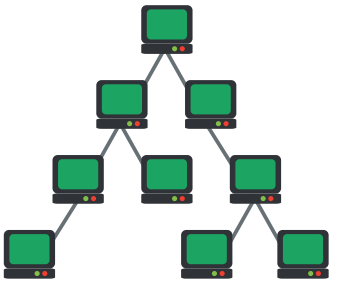


Fig. 1.14 Tree topology

Advantages of tree topology

- More devices can be added in a tree topology. This, in turn, makes it easy to send signals over long distances and suitable for large networks.
- If a computer goes down, only the nodes connected will shut down. Rest of the network will continue to work normally.

Remember

For accessing a shared drive, the drive should be on the Shared mode. You can directly access a shared drive by typing its location in the Run box in the Start menu.

Disadvantages of tree topology

- It has huge cabling requirement.
- Failure of the central node shuts down the entire network.
- Maintenance of a network in a tree topology is difficult.

Accessing a File from a Shared Drive

'Let me now teach you all how to access a file from a shared drive in Windows 10,' says Ms Raman. She guides the students through these steps.

1. Open the **File Explorer** (Windows key + E) and double-click on the **Network** icon.
2. The **Details** pane of the **Network** window will show a list of shared drives.

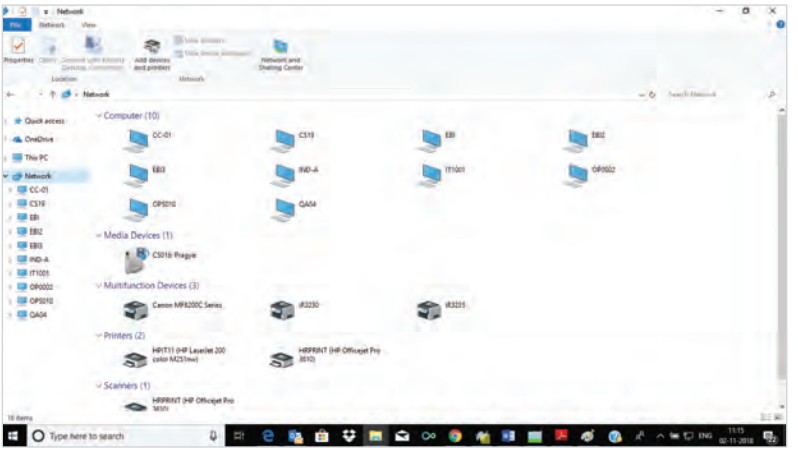


Fig. 1.15 Network window

3. Select the shared drive you want to browse.
4. Go to the required folder and then the file. Double-click on the file to open it.

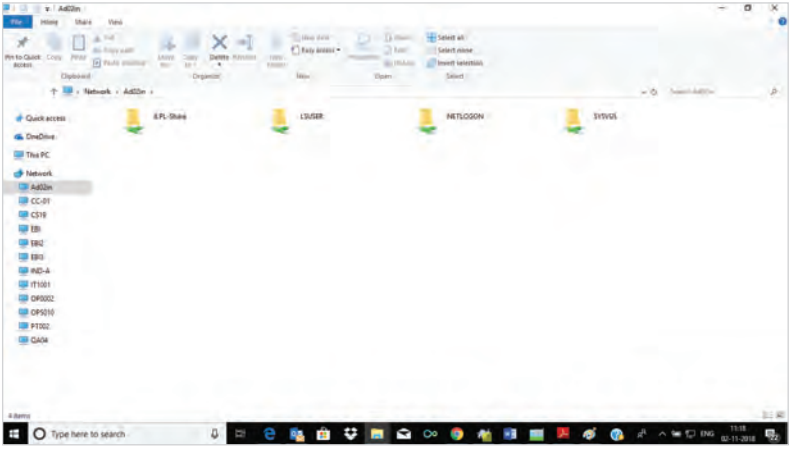


Fig. 1.16 Selecting a Shared Drive

Quick Learn

Shanaya has to build a network where she can work with all her friends, but she is low on budget. She cannot afford to spend too much on setting up the network. Which topology should she opt for?

Checkpoint

Answer the following questions.

1. Define ‘network topology’.
2. Explain the difference between the star and mesh topologies.
3. Which of the following topologies contains the maximum number of links?
   a) Star b) Mesh
   c) Ring d) Bus
4. List down the steps to access a shared drive on Windows 10.

Network Security

Ms Raman emphasizes the need to secure a network against unauthorized access. She explains to the class that in a computer network, multiple users access the same data, and thus it becomes important to manage access to the network. For example, an unauthorized user can access the network of an organization and try to modify or steal confidential data.

Network security is ensured in many ways. Two of the most common ways are as follows:

- Each authorized user is given a unique username and password for accessing the network.
- Different users are given different types of access rights, such as read-only access, read-write access, and no access.

Key Terms

Computer network	Multiple computers interconnected for the purpose of sharing data and resources
Server	A computer that processes the requests and delivers data to other computers
Protocol	A set of rules used by computers to communicate over a network
Port	A connection point to connect some other device to it
Node	The points through which information and data flow on a network
Topology	A way in which computers are connected on a network

Recap

- Networking is a communication process in which multiple computers are interlinked and share information and resources with each other.
- There are many hardware devices that are required to establish a network between computers.
- The network interface card (NIC) sends out data from a computer to other computers over the network.
- Modem (modulator/demodulator) is responsible for conversion between analogue and digital signals.
- When you connect multiple computers to a network, they all exchange information via a central device, called hub.
- A switch is a smart hub that maintains a table containing the addresses of the computers it sends data to. It remembers the addresses of the machines attached to it.
- A repeater is device that allows the signals to travel longer distances over a network.
- Routers are the smart switches that connect one network to other.
- A bridge is a device that connects two LANs or two segments of the same LAN.
- A gateway is like a passage that connects networks using different protocols.
- Computer networks are classified based on the geographic area they cover.
  - A PAN is a network of personal devices equipped to handle networking within a limited area.
  - A LAN is restricted to a small geographic area, typically within a building.
  - A MAN generally spans across multiple buildings of large companies, school campuses, cities, or towns.
  - A WAN spans to larger geographic areas. The internet is an example of a WAN.
- A network topology is a way in which various devices of a network are connected. Bus, star, ring, mesh, and tree are the main categories of network topologies.
  - The bus topology uses a single cable to connect multiple devices.
  - The star topology comprises a hub to which all devices are connected.
  - In a ring topology, each device is connected to two of its immediate neighbours only.
  - In a mesh topology, all the devices are connected to each other independently.
  - In a tree topology, there is only one connection between two nodes.
- Network security is an activity designed to protect our network from unauthorized access.

Exercise

A. Choose the correct options.

1. Which of the following devices connects two LANs or segments of two LANs?
   a) Repeater b) Router c) Hub d) Bridge
2. Which of the following types of networks generally covers a city or town?
   a) WAN b) MAN c) LAN d) PAN
3. In which type of network topology, a single cable is used to connect multiple devices?
   a) Star b) Bus c) Mesh d) Ring
4. Which of the following is a device that is used to convert analogue signals to digital signals?
   a) Router b) Switch c) NIC d) Modem
5. Which of the following network topologies contains a maximum number of links?
   a) Mesh b) Star c) Bus d) Ring

B. State *true* or *false*.

1. The internet is a type of network.
2. A switch broadcasts message to all the devices connected.
3. A bus topology is a multipoint topology.
4. A modem is responsible for connecting different networks.
5. The full form of NIC is network interface card.

C. Fill in the blanks.

1. The _____ is also known as the network adapter.
2. The computer network that is used personally is known as the _____.
3. To access a computer network, an authorized user is assigned a unique _____ and _____.
4. The largest WAN is the _____.
5. In a _____topology, all the devices are connected to each other independently.

D. Answer the following questions.

1. Define ‘networking’. List the advantages of networking.
2. How is a router different from a switch?
3. What is the difference between a MAN and WAN?
4. Briefly explain what is network security? How is it ensured?
5. Write short notes on the following:
   a) Bus topology b) Ring topology c) Mesh topology

Application-based Questions

1. Karan has set up a project where he wants to share data with all his friends in one go. Identify the network topology he has to create, and list the components that will help him send data to everyone.
2. Akriti is on a very important mission in Korea. She has to coordinate with each of her staff members and give them instructions regularly. She cannot afford a break in the network. Which type of network topology should she use?
3. Army public school is planning to set up a network between all its wings. There are three wings—Wing A, Wing B, and Wing C. The distances between these wings and the number of computers in each wing are as follows:

Distance between various wings

Wing A to Wing B	100 m
Wing A to Wing C	300 m
Wing B to Wing C	150 m

No. of computers

Wing A	50
Wing B	100
Wing C	10

a) Suggest a suitable topology for creating a network of computers in all the wings.
b) Which network device must be used?

Lab Activity

1. Find out the network used to connect computers together in your school and then make a map to show the network connections. Physically observe the differences between a router, switch, and hub. Find out which type of computer network is used in your computer lab. Ask your teacher how the network security is done in your computer lab. How many NICs are connected to your computer?
2. Open a shared drive, and try storing and retrieving documents from there.
   a) Go to the Shared Drive, and create a folder there. Now write a note on computer networking in a Word document and save it there as 'computernetworking.doc'.
   b) Now create another folder in the Shared Drive. Copy and paste the Word doc 'computernetworking.doc' in this folder.

Project

Find out about networking cables (twisted pair cable, coaxial cable, and fibre optic), and write all the information in a Word doc.

Explore More

- Do research on the Defender software available in Windows 10.
- Find out about Bluetooth and Wi-Fi technologies.

Weblinks

http://www.pearsonitcertification.com/articles/article.aspx?p=30191

Notes for the Teacher

- Have a discussion with the students explaining the use of different types of networking components.
- If possible, give them a live demonstration of the networking components.

2 Linux Operating System

After going through this chapter, you will be able to—

- **understand** the need for an operating system;
- **list** the features of Linux;
- **list** the advantages of Linux; and
- **differentiate** between Linux and Windows.

It's Sunday, and Nidhi is playing a game on her computer. She studies in class 8. While she is playing the game, just then her brother, Nilesh, comes in.

'Do you know how a game on a computer runs?' asks Nilesh.

Nidhi finishes the game and says, 'No, actually I often wonder about what happens in a computer that allows us to play games.'

'It's the operating system that enables us control our actions in a game using a keyboard and a mouse?' says Nilesh.

'Oh, yes! I learnt about Windows operating system in class 6,' exclaims Nidhi.

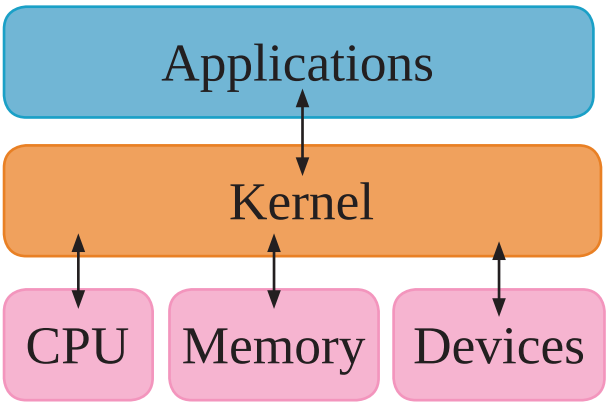
Nidhi is now curious to know more about operating system. She wants to know what other operating systems she can use.

Operating System

Next day, Nidhi requests her computer teacher, Ms Reddy, to tell her more about operating systems. Ms Reddy assures her that she will introduce the whole class to a new operating system (OS). But before that, she briefs the class about the operating system to reinforce the concepts.

She begins by explaining that an operating system is a program that comprises various components. Some of these components are required to be stored in the main or the primary memory of the system. These are loaded when they receive command from the operating system or any other application program. Some of these components are invoked by the user.

Ms Reddy further explains to the class that the most important part of the OS is kernel. It contains the components of the operating system that resides in the main memory of the computer. The kernel of the operating system is loaded into the memory during the booting process. An application software communicates with the kernel through the system calls. The kernel communicates with hardware units through the device drivers.



Did You Know?

The major part of today's Linux kernel is written in the C programming language.

Need for an Operating System

Ms Reddy emphasizes the need for an operating system. She tells the class that an operating system provides the user an interface, which communicates between hardware and the user.

She gives the example of playing games on a computer, and explains to the class that an operating system deals with the following operations:

- What actions are to be performed
- When these actions are performed
- How these actions are to be performed

'For example, if you have to perform an action stunt while playing a game on a computer, you simply press the required keys on the keyboard or click on the required buttons using the mouse. This information is then passed on to the operating system, which takes care of the outcome by handling the actions that are to be performed,' Ms Reddy tells the class.

Nidhi now recalls what she learnt about operating systems in pervious classes.

Ms Reddy asks the class to name an operating system. The entire class says, 'Windows'.

'Good. That means you remember studying about the Windows operating system in previous classes. Let me now introduce a new operating system—Linux,' says Ms Reddy.

Ms Reddy tells the class that Linux is an open-source operating system and shares this information:

'It was developed by Linus Torvalds, a computer science student at the University of Helsinki. He developed Linux at the age of 21.'

Ms Reddy informs the class that Linux has a GUI as well as CUI and some of the tasks can only be performed through the CUI. The most popular Linux distributions are Ubuntu Linux, Linux Mint, Fedora, Open SUSE, and Debian.

History of Linux

Ms Reddy shares the history of Linux with the class.

In 1964, MIT and Bell labs developed an OS—MULTICS (Multiplexed Information and Computing Service)—meant only for a single platform. Later, Dennis Ritchie and Ken Thompson of MIT further worked on MULTICS to develop it into a platform-independent OS. They came up with a new system called Unics. The first version of Unics was written in the assembly language of the computer DEC PDP-11, but it was not platform independent.

Ritchie had already developed some code for Unix. Ritchie and Ken then rewrote the Unics in the C programming language, which included the code written by Ritchie. This gave rise to Unix—a new OS—which was platform independent. But it was not a free operating system.

In 1983, Richard Stallman of MIT started a project to create a Unix-like operating system that would be free and open source. It was named the GNU project, where GNU meant GNU's not Unix. This meant that GNU would be similar to Unix but not actually Unix. Richard got help from various programmers around the world, who freely contributed to the project. Later, he founded the Free Software Foundation (FSF) and also defined the GNUs General Public License (GPL).

Several different versions of GNU came into being. One of them was Berkeley Standard Distribution (BSD), which was developed by the researchers at the University of California Berkeley. By 1990, the members of the open source community developed some version of Unix based on BSD Unix.

In 1991, Linus Torvalds decided to build a new OS kernel and provide it as a source code for others to modify and create new versions. Stallman and some members in the FSF group refer to Linux as GNU/Linux as they say that much of Linux is built on the top of the GNU project.

Features of Linux

Ms Reddy now discusses some features of the Linux operating system.

Open Source

Linux source code is freely available, and it is a community-based development project. Multiple teams work in collaboration to enhance the capability of Linux operating system and it is continuously evolving.

More Stable

Linux has a feature that protects memory between all processes. Hence even if one process fails, the computer will not be forced to shut down.

Remember

An operating system is responsible for any communication between application software and a hardware unit.

More Secure

The security features of Linux are more robust than those of any other commercial operating system. The login check is very secure, combined with various encryption formats and credential verification systems.

Unified Memory Pool

One of the most important features of Linux is its memory. It has a unified memory pool for disk cache and application program so that unused memory can be used for caching. In addition, while running a large program, the cache can be reduced flexibly. Cache memory is the memory component that stores frequently accessed data so that it becomes easier for future requests for the data.

Less Vulnerable to Viruses

Along with encryption and multiple firewall settings, Linux is a very secure operating system. Furthermore, the security checks make Linux almost virus resistant.

Checkpoint

Fill in the blanks.

1. A GNU Linux is a free operating system developed under _____ license.
2. The Linux login check combines various _____ formats and _____ verification system.
3. Linux has unified memory pool for _____ and _____.
4. Linux has encryption and multiple _____, which makes it a secure operating system.

Advantages of Linux

Ms Reddy now emphasizes the advantages of Linux.

Low Cost

Linux is an open-source operating system available free of cost on the internet. The cost of running Linux is also low as compared to other operating systems.

Stability

It is a stable operating system. It does not crash too often and runs smoothly.

Did You Know?

The operating system of Android was also developed using Linux, as was the macOS operating system that Apple uses for its computers.

User Interface

The interface of Linux operating system is flexible and provides many ways to customize it.

Use of Hard Disk

Linux does not occupy too much space in a computer's hard disk. For example, if the hard disk of your computer has a total space of 320 GB, Linux will occupy less than 5% of the hard disk space.

Quick Learn

Differentiate between the working of Windows and Linux operating systems.

Multitasking

With Linux, it is possible to run multiple applications on a computer without any problem. This enables a user to work on different applications simultaneously.

Comparison of Linux with Windows

Ms Reddy now shows the table and compares Linux and Windows OS.

	Linux	Windows
Costing	Linux and the GNU utilities and libraries are entirely free and open source.	Windows requires a license.
Ease of use	Linux-based OS can require some training for a first-time user.	Windows is one of the most commonly used operating systems in the world as it is easy to learn.
Software	There are plenty of programs available for Linux that come in easy-to-install packages and are mostly free.	Windows has the maximum number of users, which brings a large selection of all types of software support and games.
Security	Linux's open source allows anyone to identify the system flaws.	Microsoft has been making efforts to improve security features over time.

File Management in Linux

Ms Reddy now explains how file management is done in Linux.

Creating a file in Linux is very similar to how it is done in Windows, except that the applications you use may be different. For example, instead of Microsoft Office, you may use OpenOffice, Google Docs, or something similar. Some applications are available for both Windows and Linux, such as GIMP and Tux Paint, and they work the same way to create, save, and open files.

Folders too can be created the same way in Linux as in Windows. As you know, folders are used to organize your files for future reference.

In general, Graphical User Interfaces (GUIs) work the same way across all operating systems, both on computers and mobile devices, such as a smartphone or tablet. For most computer operations, the GUIs of both Linux and Windows work more or less the same way, though they look different in appearance.

Key Terms

GUI	A user interface that allows users to interact through the icons
CUI	A user interface that allows users to interact by entering commands
Cache	A memory area that stores frequently accessed data to serve future requests faster

Recap

- An operating system is required to enable communication between hardware and software.
- Linux was developed by Linus Torvalds.
- Linux is an open-source operating system that is free for all.
- Linux-based operating systems are considered more secure compared to other operating systems.
- We can make multiple workstations and use them simultaneously in Linux.
- Linux is a low-cost, stable, and high-performing operating system. It is easy to install and lets users multitask.
- Linux has many programs that are similar to those in Windows.
- One unique feature of Linux is that it uses unified memory pool for disk cache and application program. It lets users to use unused memory for caching.
- In Linux if a process fails, the memory is protected and the computer does not crash.

Exercise

A. Choose the correct options.

1. Which of the following is an open-source operating system?

   a) Windows 10 b) Windows 8 c) Boss Linux d) All of these

2. In which of the following languages was the first version of Unics written?

   a) High-level b) Assembly c) Machine d) None of these

3. Who is the developer of Linux?

   a) Steve Jobs b) Mark Zuckerberg c) Linus Torvalds d) Bill Gates

4. Which of the following platform-independent operating systems was developed by Ritchie and Ken?

   a) MULTICS b) Unix c) Unics d) GNU Linux

5. In which of the following languages the Linux kernel is written?

   a) C b) Machine c) C++ d) Java

B. State *true* or *false*.

1. Linux does not crash too often.
2. MULTICS was an open-source and platform-dependent OS.
3. Linux has a strong focus on security.
4. Richard Stallman was the founder of the FSF.
5. Debian is a Linux distribution.

C. Fill in the blanks.

1. The _____ is the most important part of an OS.
2. The kernel of the OS is loaded into the memory during the _____ process.
3. An application software communicates with the operating system kernel through the _____.
4. The _____ communicates with hardware units through the device drivers.
5. A _____ is the memory area that stores the frequently accessed data.

D. Answer the following questions.

1. What is an operating system? Explain any two features of the operating system.
2. Define the term ‘kernel’.
3. Write the features of Linux operating system.
4. How are Windows and Linux different?
5. Explain the differences between CUI and GUI.

Application-based Question

In which memory—primary or secondary—the kernel resides?

Lab Activity

1. Learn to use keyboard shortcuts and explore more about the file system in Linux version.
2. Write down the steps to open the command line interface in a Linux version. You can carry out the task in your computer lab if a system runs on Linux or you can download it on your personal computer. (Take the help of your teachers or elders.)

Project

1. Run Linux as your operating system and learn how to create a partition in your hard disk drive. Also learn to perform basic functions in Linux, such as how to create a folder, how to create a username and password for login. You can take the help of your teachers or elders.
2. Create files and folders using Linux. Now prepare a PowerPoint presentation on ‘Creating files and folders in Linux’. Add a separate slide on the related shortcuts.

Explore More

- Compare Linux (any distribution) and macOS operating systems.
- Find out about Edubuntu, which is a version of Ubuntu.

Weblinks

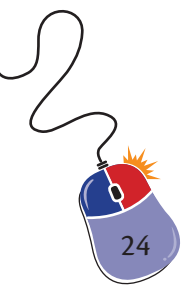
- https://opensource.com/resources/linux
- https://www.ubuntu.com/
- https://www.edubuntu.org/

Work Wisely

- Always delete unwanted files from time to time to make your system run smoothly over a long period of time.
- As GUI works the same way across all operating systems, learn the basics of creating files and folders both in Windows and Linux.

Notes for the Teacher

Help the students understand the core differences between Linux and Windows practically with examples. Show them a running example of Linux or an application based on it and show the features as highlighted in the book. Make them understand the use and speciality of Linux.



3 Layers in GIMP

After going through this chapter, you will be able to—

- **work** with layers and
- **apply** filters to an image in GIMP.

Akash has been promoted to class 8. In previous classes, he learnt about GIMP, which is a type of image manipulation software. He knows how to insert images in GIMP and work with them. He can use the basic tools of GIMP in editing an image. These tools include various interesting Transform and Paint tools.

In this chapter you will learn, along with Akash, how to work with layers in GIMP and apply filters.

What is a Layer?

Ms Anurima Reddy is a new computer science teacher of the class. Today she is going to teach the class more about GIMP. She starts by defining what a layer is in GIMP.

She explains that an image is made up of various components, which are called layers. Rebecca remembered once her mother telling her this while introducing her to GIMP:

'Imagine a single image made up of several photos stacked on top of each other. These several photos are layers.'

'Ma'am, in image editing we often work on layers,' says Rebecca.

'Splitting an image into layers is called layering,' this time Akash speaks.

'Great! Let me give you an example,' says Ms Reddy and explains the advantage of having layers with the help of an example:

'Let us suppose, you want to add two captions to an image. You add two layers to the image. On layer 1, you write "Caption 1" and on layer 2, you write "Caption 2". Whatever changes you make to layer 1 will not be reflected on layer 2 and vice versa. Both the captions are independent of each other. That's the benefit of layers.'

Background Layer

Ms Reddy tells the class that if an image contains only one layer, then it is called the Background layer, which is the default layer.

Adding a Layer

Ms Reddy follows these steps to add a new layer in GIMP.

1. She goes to the **Layer** menu and selects the **New Layer** option.
2. The **New Layer** dialogue box appears.
3. She selects the dimensions of the layer she wants to add. She shows the **Fill with** drop-down options and selects the transparency option.

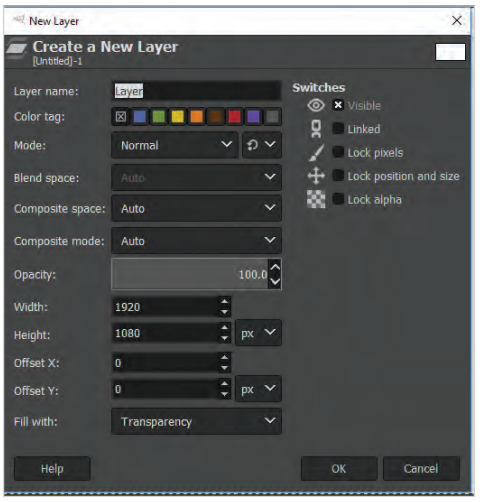


Fig. 3.1 New Layer dialogue box

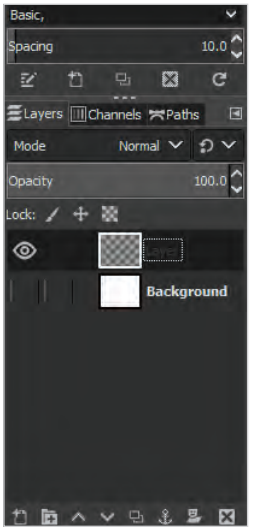


Fig. 3.2 New layer added

Ms Reddy now tells the class how to open an image as a layer.

1. She clicks on the **File** menu and then clicks on the **Open as Layers** option.
2. She browses to the location where the image is placed and selects it.
3. The image is added as the layer.

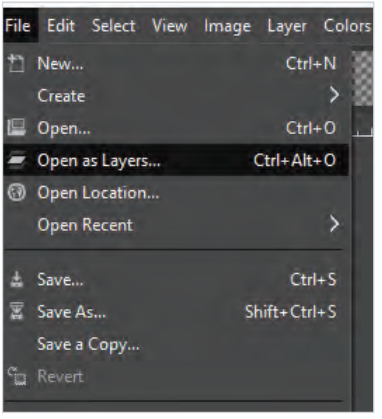


Fig. 3.3 Opening an image as a layer

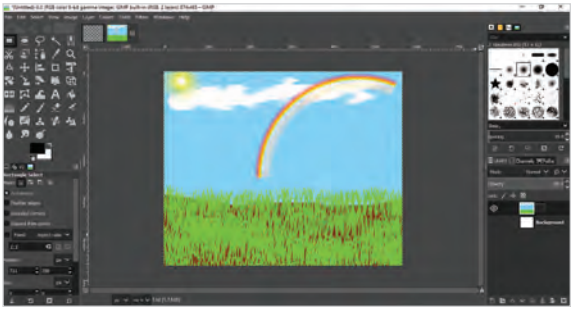


Fig. 3.4 Image added as a layer

Renaming a Layer

Ms Reddy now follows these steps to rename the layer.

1. She double-clicks on the name of the layer in the **Layers** palette.
2. She then types a new name 'Rainbow' for the layer.

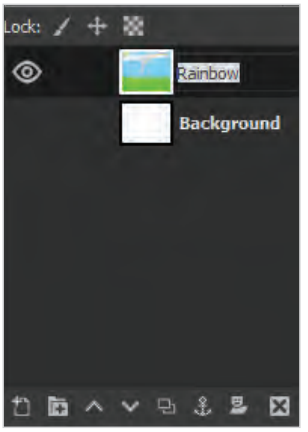


Fig. 3.5 Renaming a layer

Changing the Opacity of a Layer

'Now it's time to change the opacity of the layer,' Ms Reddy tells the class.

She selects the layer and drags the opacity slider above 100.

'The higher the opacity value, the more will be the transparency of the image,' she tells the class.

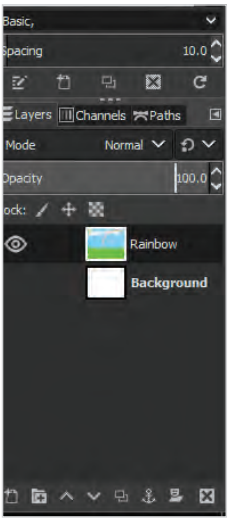


Fig. 3.6 Changing opacity

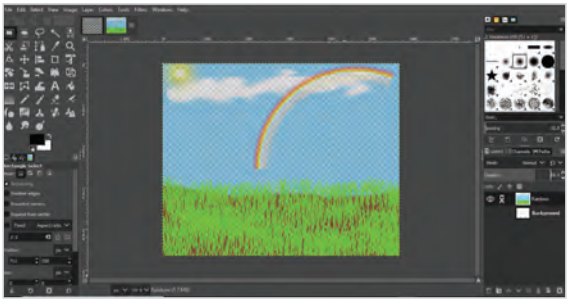


Fig. 3.7 Image with changed opacity

Now Ms Reddy adds a new image as a layer. The image shows three birds flying in the sky.

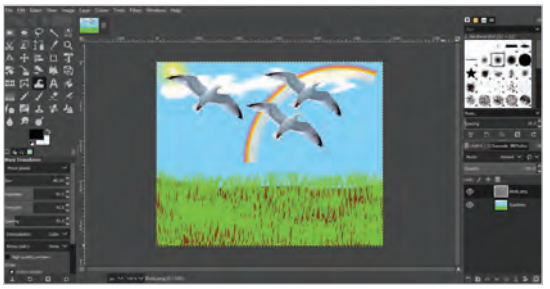


Fig. 3.8 New image added as a layer

Quick Tip

To unhide a layer, click on the Eye icon again.

'While working on a layer, you can hide other layers. Just click on the Eye icon next to the layer you want to hide in the Layers palette,' says Ms Reddy and hides the layer 'Rainbow'.

Changing the Order of Layers

Ms Reddy tells the class that the order of the layers can be changed. She demonstrates these steps to children.

1. She clicks on the **Layer** menu.
2. She points to the **Stack** option. A submenu with various options appears. She asks the children to select the desired option.

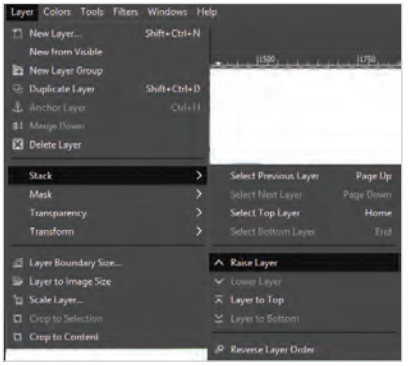


Fig. 3.9 Selecting the Stack option

Locking a Layer

To show how to lock a layer, Ms Reddy performs the following steps.

1. She clicks on the layer 'Rainbow' as she wants to lock it.
2. She shows the three lock options on the Layers palette:
   - **Lock pixels button**: Protects the entire layer
   - **Lock position and size**: Protects the position and size of the layer
   - **Lock alpha channel button**: Indicates transparency and only protects transparent area

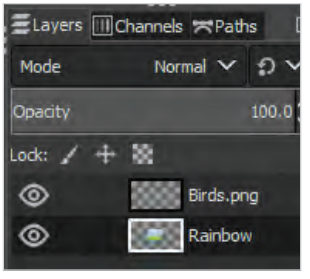


Fig. 3.10 Locking a layer

Saving an Image with All Layers

Ms Reddy now saves the image with all the layers. She follows these steps.

1. She goes to the **File** menu and selects the **Save As** option.
2. The **Save Image** dialogue box opens. Ms Reddy selects the location where she wants to save the image and types in the name of the image.
3. She then clicks on the **Save button**.

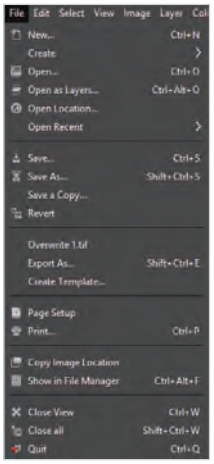


Fig. 3.11 Selecting the Save option

Fig. 3.12 Save Image dialogue box

Ms Reddy tells the class the image is saved with the '.xcf' extension.

Resizing a Layer

Ms Reddy tells the class that if the contents of the layer are larger than the new layer size, the image or selection will be cropped to fit the new layer size. In that case, you can use X Offset and/or Y Offset to place the original layer in a particular spot inside a larger resized layer.

Ms Reddy now demonstrates the steps to resize a layer canvas.

1. She clicks on the **Image** menu and selects the **Canvas Size…** option.
2. The **Set Image Canvas Size** dialogue box opens.

She asks the children to resize the image as needed and clicks on the Resize button. The image canvas gets resized.

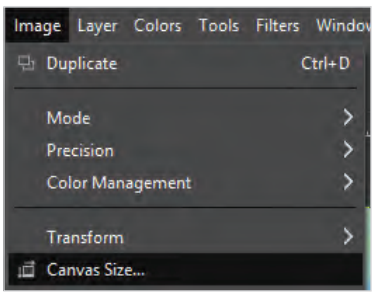


Fig. 3.13 Selecting the Canvas Size option

Fig. 3.14 Set Image Canvas Size dialogue box

Checkpoint

Answer the following questions.

1. What do you understand by a layer in GIMP?
2. How can you create a new layer? Write the steps.
3. Write the steps to rename a layer.
4. You have added four layers in GIMP. How can you shift the bottom-most layer to the topmost position?
5. Write the steps to save an image with layers.

Filters

Ms Reddy now introduces the children to filters.

'GIMP offers us a large number of filters. These allow us to transform the images in many ways,' she tells the class.

Ms Reddy now lists down the use of the various filter options as follows:

Blur: This option includes different types of blur filters.

Distorts: This option is used to create effects similar to kaleidoscopic patterns.

Noise: This option is used to add noise effects to an image.

Edge-Detect: This option contains filters to find the edges or colour boundaries in an image, which is useful while working with layered images. These filters also let you strengthen or smoothen the contours of an object. You can also use edge-detect filters for making easy selections with the magic wand or easy fills with the Bucket fill tool.

Generic: This option includes mathematical filters that use a matrix for image manipulation.

Combine: This option provides several ways to combine several pictures to create a new one.

Artistic: This option includes filters to create artistic effects. It is useful to create paintings and mosaic patterns.

Map: This option is used to alter an image in relation to an image map.

Render: This option is useful to render all kinds of shapes and objects and is also used for creating textures or patterns.

Animation: This option includes an animation player to play animations. It also contains an animation filter, which reduces the size of the animation to occupy less space on the disk.

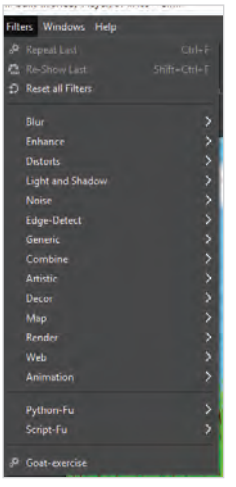


Fig. 3.15 Filters menu

‘There are more than 50 filters available in GIMP. These let you apply various effects to your image. You can explore them on your own,’ says Ms Reddy.

She now shows the steps to apply a filter to the students.

1. She clicks on the **Filters** menu.
2. A submenu appears. She then selects the **Gaussian Blur…** option.

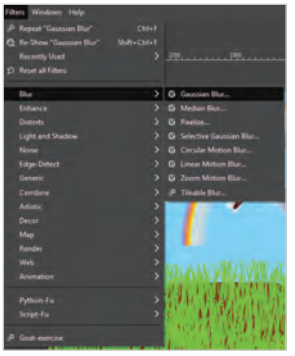


Fig. 3.16 Gaussian Blur filter

3. The **Gaussian Blur** dialogue box appears.

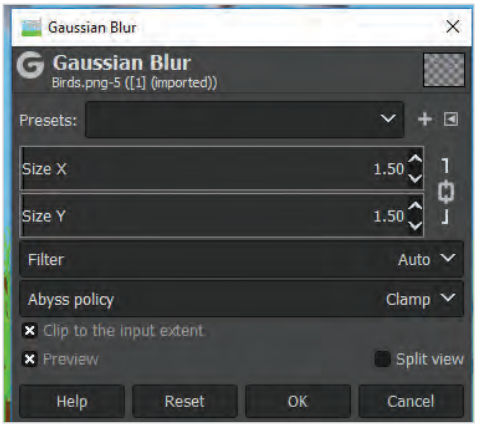


Fig. 3.17 Gaussian Blur dialogue box

4. Ms Reddy tells the class to adjust the settings if needed. The filter gets applied to the image.

The entire class is happy. They can do various things with an image in GIMP now.

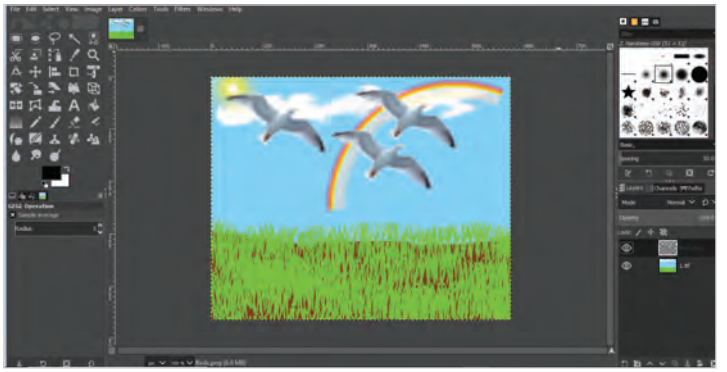


Fig. 3.18 Image after applying Gaussian Blur filter

Key Terms

Layer	Various components that together make up an image
Opacity	Not being transparent

Recap

- GIMP is an image-editing tool available in Windows and macOS.
- An image is made up of various components, which are called layers.
- You can add, rename, or change the order of the layers in GIMP.
- While working on a layer, you can hide other layers by just clicking on the Eye icon next to the layer you want to hide.
- There are three lock options on the Layers palette:
  - ➢ Lock pixels button to protect the entire layer
  - ➢ Lock position and size to protect the position and size of the layer
  - ➢ Lock alpha channel button to indicate transparency and to protect transparent areas
- An image in GIMP is saved with the '.xcf' extension.
- GIMP offers us a large number of filters. These allow us to transform the images in many ways.

Exercise

A. Choose the correct options.

1. Which option will you click to change the orders of layers?
   a) Filters b) Stack c) Reorder d) None of these
2. Which of the following features of GIMP allows you to work on every piece of an image independently?
   a) Tool b) Filter c) Layers d) All of these
3. Which of these Lock option buttons protects only the transparent area of a layer in GIMP?
   a) Lock pixels b) Lock position and size
   c) Lock alpha channel d) None of these
4. Which of these features of GIMP helps to add effects to images?
   a) Tools b) Filters c) Layers d) None of these
5. What is the default file extension of a GIMP file?
   a) .gmp b).xcf c) .xfc d) .gimp

B. State *true* or *false*.

1. The Lock pixels option protects the entire layer.
2. Gaussian blur is a type of blur filter.
3. A layer can be renamed by double-clicking on its layer name.
4. It is not possible to change the order of layers.
5. To hide a layer, click on the Eye icon.

C. Fill in the blanks.

1. The Canvas Size option is present under the _____menu.
2. To apply a filter on an image, click on the _____menu.
3. The _____filter option is used to add effects similar to kaleidoscopic patterns.
4. To unhide a layer, click on the _____icon.
5. The default layer is named as _____.

D. Answer the following questions.

1. What are layers in GIMP? How can you create a layer?
2. Can you change the stack order of the layers in GIMP? If yes, explain how.
3. How can you rename a layer? Write the steps.
4. Write the steps to add an image as a layer.
5. What are filters? How would you apply the Fog filter?

Application-based Questions

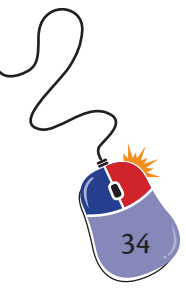
1. Kiara has added an image to GIMP. She wants to apply the ripple effect. Which filter can she use and how?
2. Kiara adds an image to GIMP. She wants to add another image and have both the images on different layers. When she adds the second image, she notices that the previous image gets replaced. What must have gone wrong. Write the correct steps to accomplish the task.

Lab Activity

1. Create a scenery in GIMP, and do the following:
   a) Create an image of mountains, a river, and a hut in GIMP.
   b) All three elements of the image should be on a different layer.
   c) Keep the background white.
   d) Add a caption 'Scenery' on the fourth layer.
2. Open GIMP and carry out these activities:
   a) Open an image and add three layers to the image.
   b) Rename the layers as Layer1, Layer2, and Layer3.
   c) Hide Layer2 and Layer3 and work on Layer1.
   d) Add various filter effects to Layer1.
   e) Now work on Layer2 and Layer3 one by one, hiding other layers.
   f) Apply different filters to other layers.

Project

1. Add an image of yours to GIMP and edit is using the various options.
2. Create a scenery by adding or painting images, and using the layers options. Also, apply the filters effect.



Explore More

- Find out more about using filters in GIMP.
- Learn about masking in GIMP.
- Learn how to export images to different file formats.

Weblinks

- https://www.gimp.org/
- https://www.gimp.org/tutorials/
- https://howtogimp.com/help/help-with-gimp/gimp-tutorials/

Work Wisely

- Always keep layers other than the active layer invisible so that you can concentrate on the active layer.
- Avoid applying more than two filters on a layer. It does not look attractive.

Notes for the Teacher

- Emphasize the importance of adding layers.
- Give the assignments involving use of filters to the class.

4 Introduction to Database and DBMS

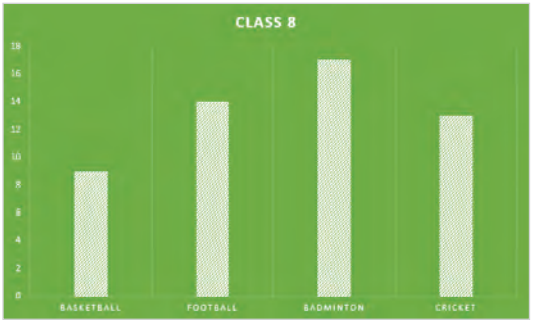
After going through this chapter, you will be able to—

- **understand** database, its types, and how to create it;
- **learn** different types of data type; and
- **perform** calculations on data stored in the database.

Sanya studies in class 8 in Modern Public School. The sports week is approaching, and she has been assigned a task of segregating students into different groups based on the sports activity they are interested in.

Sanya collects data of her class and finds that 10 of the students are interested in basketball, 11 in football, 15 in badminton, and 20 in cricket. She creates a table showing the data by adding tally marks. She also creates a column chart to represent her findings.

Sports Activity	Tally	Total
Basketball	𝍸	10
Football	𝍸 |	11
Badminton	𝍸 𝍸	15
Cricket	𝍸 𝍸 𝍸	20



Database

Sanya's teacher, Ms Reddy, is all smiles and praises Sanya for her outstanding data-management technique. She organized her data well as it was easy to read and understand.

Ms Reddy explains to the class that Sanya has converted some raw meaningless data to a vital piece of information. She can manage, access, and update this information, whenever required. A well-organized collection of information that can be easily managed, accessed, and updated is known as a database. A database contains information in the form of rows and columns.

Ms Reddy gives some more examples of databases. She tells the class that a dictionary is also a database as it stores word and their meanings in an alphabetical order. A list of students' information in schools is also a database.

The class is curious to know more about database. Ms Reddy is happy to help young minds.

Types of Databases

Ms Reddy now lists down the types of databases as given below.

- Network database
- Object-oriented database
- Hierarchical database
- Relational database

She tells the class that the relational database is the most widely used database. It organizes data in the form of tables. The rows in the table are called records and columns are called fields. A record contains all the information about one entity. Each field defines a unique piece of data for all records. A table can have only one field of each type. Each table has a unique key column, which connects it to other tables.

Remember

In an RDBMS, tables are known as relations, rows are known tuples or record, and columns are called attributes or fields.

Ms Reddy now creates a table *EmpDetails* to make students understand the concept in a better way.

Fields

Records

E_id	E_name	Contact No.	Department
E_01	Kirti	98781xxxxx	Administration
E_02	Urvashi	77090xxxxx	Editorial
E_03	Anurag	88044xxxxx	Editorial

She further explains that in the *EmpDetails* table, there are three records that contain the information about three entities *Kirti*, *Urvashi*, and *Anurag*. There are four fields—*E_id*, *E_name*, *Contact No.*, and *Department*, each of which contains a unique information for these three entities.

Database Management System

Ms Reddy now explains that a database may be generated and maintained manually, or it may be computerized. But sometimes it becomes quite difficult to manually organize and manage a database if there are hundreds or thousands of records. The chances of committing errors increase. Thus, a computerized database is always easy to deal with.

A computerized database can be generated and maintained by a set of application programs written for that task or by a database management system. A database management system (DBMS) is a system that stores data and gives end-users the ability to store, retrieve, and modify data in a database and to remove data from a database.

Introduction to Access

Sanya is back home from school. She discusses her new-found knowledge on database with her father, Mr Juneja. He asks Sanya a few questions about database. She has answers to all his questions.

Mr Juneja is quite happy with Sanya's knowledge. He decides to impart his knowledge of database management system to Sanya. He works in a corporate company and uses a DBMS for managing the organization's data. This DBMS application is Microsoft Access.

Mr Juneja further tells Sanya that Access is a type of application software developed by Microsoft for creating and managing a database. The interface of Access is similar to the other Microsoft applications, such as Excel, Word, and PowerPoint.

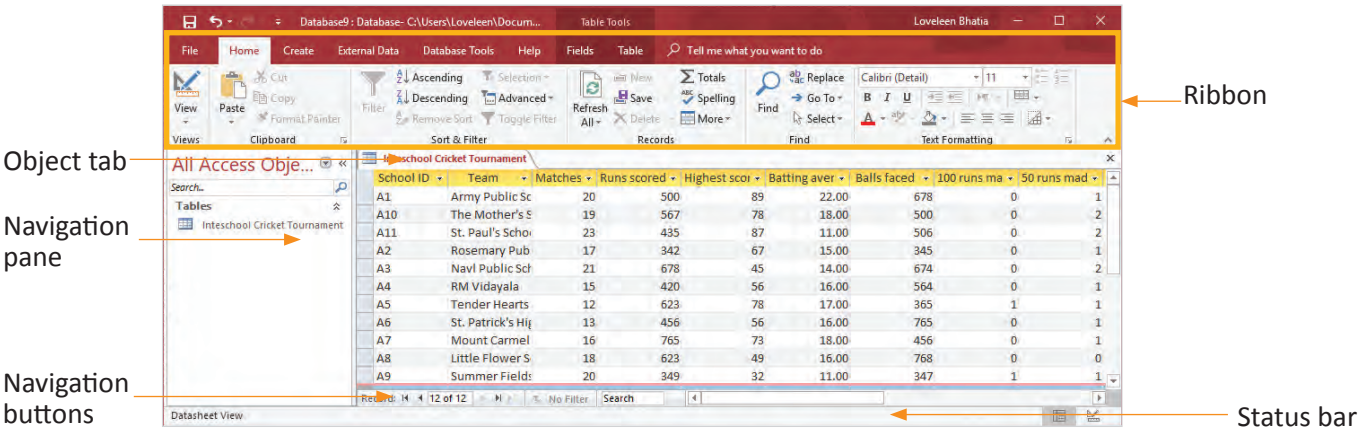


Fig. 4.1 Components of Access window

Mr Juneja explains to Sanya that Access contains different objects. He then describes these objects as follows:

- **Table:** It stores data in the form of rows and columns.
- **Form:** It allows you to create a user interface for a database application.
- **Query:** It lets you retrieve data from one or more tables based on a selection criteria.
- **Report:** It lets you view, summarize, or format the information.
- **Macro:** It is used to automate the tasks that are repeatedly used.

Creating a Database

Sanya's father tells her that there are two different ways to create a database—using templates and using the blank database option. A template is a ready-made database.

Creating a Database Using Templates

Sanya first decides to create a database by using a template. The steps she follows are listed below.

1. She opens Access.
2. She finds a list of templates on the right side of the window.

3. She explores some of the options and selects the **Contacts** template. The **Contacts** pane opens on the screen.
4. She enters a name for her database in the **File name** box and clicks on the **Create** button. The database appears in the **Form** view.

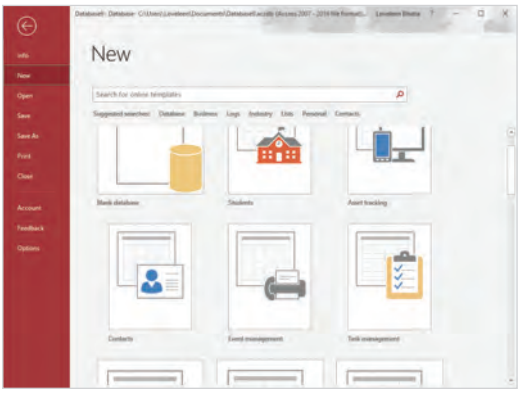


Fig. 4.2 Selecting Contacts template

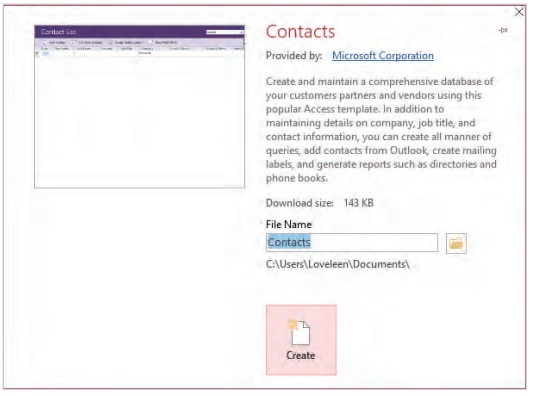


Fig. 4.3 Contacts dialogue box

5. Her father asks her to click on the **Layout View** button on the right side of the status bar. The **Form Layout Tools** contextual tab appears on the **Title** bar.
6. She clicks on the **Add Existing Fields** button in the **Tools** group under the **Design** tab.
7. She selects the desired field from the list, drags it, and drops it to the desired position.

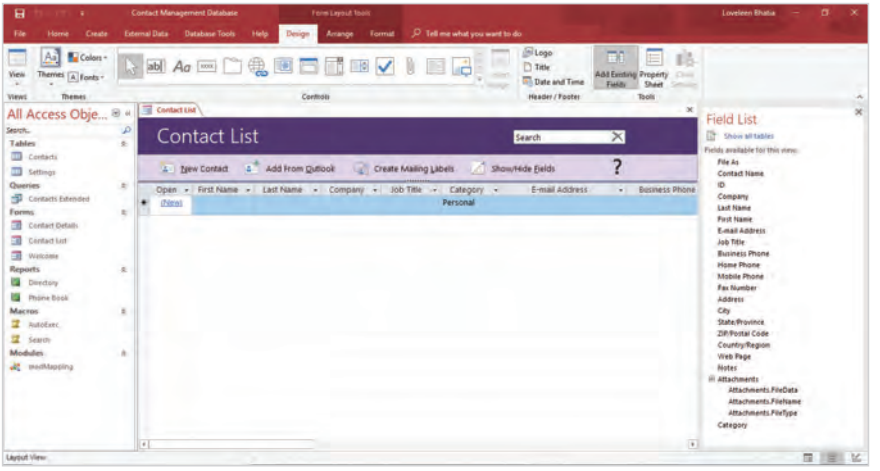


Fig. 4.4 Contact List table

Creating a Database Using Blank Database Option

'I want to create a database for the interschool cricket tournament. How can I do that, Papa?' asks Sanya.

'Let me explain to you how to create a database right from the scratch. Open a blank database to get started,' says Mr Juneja.

Sanya is quick in creating a blank database. This is how she creates a blank database.

1. She clicks on the **blank database** option. The blank database pane opens.
2. She then enters the desired name in the **File Name** text box and clicks on the **Create** button. A new database gets created with an empty table named **Table1**.

Sanya notices that the **Fields** tab is selected by default. A new tab, **Table Tools**, appears on the title bar.

She now follows these steps as advised by her father.

1. She double-clicks on the field names to delete the default names and enter some meaningful names.
2. She then populates the table with the desired data.
3. She saves the database by clicking on the **Save** button on the **Quick Access Toolbar.**

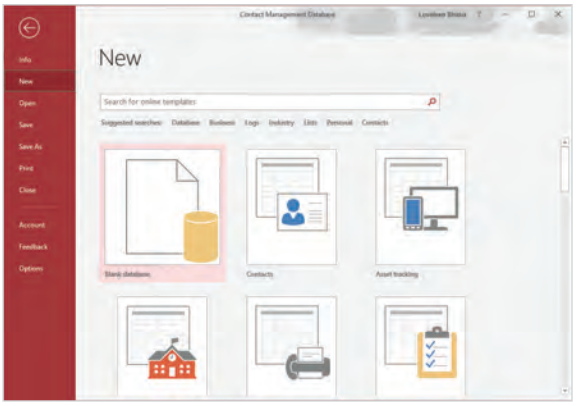


Fig. 4.5 Selecting Blank database option

Rules for Naming a Field

Sanya's father asks her to remember the following rules to name a field as described below.

- A field name can be 1 to 64 characters long.
- A field name can include letters, numbers, and some special characters. An underscore (_) sign can also be used.
- A field name cannot begin with a blank space.
- A field name cannot have a period (.), an exclamation mark (!), the grave accent (`), and the brackets ([]).
- A field name can be in lower, upper, or mixed case.

Views of a Table

Mr Juneja tells Sanya that there are two views in a table—Design and Datasheet.

Design View

The Design view is used to design the structure of the database. The Design view window is divided into two parts.

- **Field Grid Pane:** Field names and their description can be defined here.
- **Field Properties Pane:** Properties for the fields can be defined here.

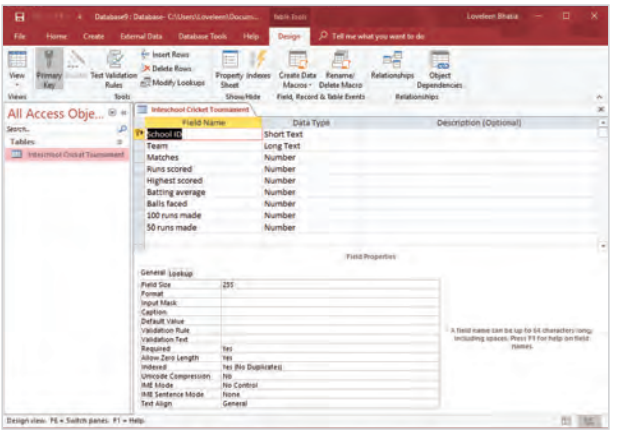


Fig. 4.6 Table in Design view

Datasheet View

Datasheet view displays a grid of rows and columns. The rows represent the records, and the columns represent the fields. The column headers are used to define the names of the fields.

Quick Tip

Use Ctrl + W to save the changes done in the table and then close it.

Switching Between the Views

'How can I switch between these two views?' asks Sanya.

'It is very simple Sanya. Let me show you,' replies Mr Juneja.

He then describes her the following way to switch between the views.

- Click on the **Home** tab. Locate the **Views** group, click on the **View** button, and select the required option.

  Or

- Click on the **Fields** tab. Locate the **Views** group, click on the **View** button, and select the required option.

  Or

- Click on the **Design View** or **Datasheet View** buttons on the right corner of the status bar.

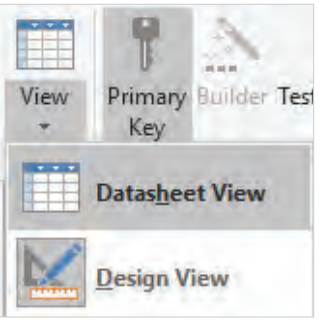


Fig. 4.7 View drop-down menu

Data Types

Sanya now knows that the information in a database is stored as a table, which is a tabular arrangement of rows and columns.

Mr Juneja tells Sanya, 'To enter data in a field, you need to select the data type for each field. A data type of the field determines what type of data it can store. For example, a field with the data type "Short Text" can store only the alphanumeric values.'

Mr Juneja then prepares a table for Sanya to give her a clear picture on the different data types available in Access.

Data Type	Usage
Short Text	It is used to store text, combination of text and numbers, and numbers, such as phone numbers and postal codes. It can store a maximum of 255 characters.
Long Text	It is used to store long sentences and paragraphs. It can store a maximum of 65,535 characters.
Number	It is used to store numeric data. It can also store decimal values. It can store a maximum of 16 bytes long data.
Date/Time	It is used to store date and time values. It allows you to display date and time in various formats.
Currency	It is used to store monetary data up to 4 decimal places. It can store up to 8 bytes of data.
AutoNumber	It is used to generate a unique sequential value for each new record added to the table. If the table does not have a primary key, it uniquely identifies the records. If a record is deleted, its AutoNumber value is not deleted and is not reused. Moreover, the remaining records are also not updated. It stores data as 4-byte values.
Yes/No	This property can have only two values—True or False. You can choose to display the values as Yes or No.
OLE Object	It is used to store pictures, graphs, or other objects, such as Microsoft Word document and MS Excel worksheet.
Hyperlink	It is used to create a link to a location on a computer's hard disk, a network location, or a website.
Attachment	It is used to attach a file to a record.
Calculated	It is used to store the results of a calculation that uses data from other fields.

Setting Data Type for a Field

Mr Juneja then explains the procedure to set the data type in the **Datasheet View** to Sanya as described below.

1. Click on the desired field header.
2. In the **Formatting** group of the **Fields** tab, click on the drop-down arrow next to the **Data Type:** field.
3. Choose the desired data type from the drop-down list.

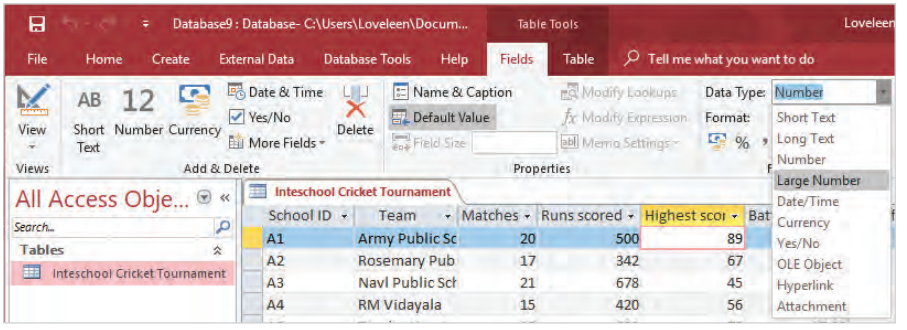


Fig. 4.8 Setting data type

Primary Key

Mr Juneja now explains another important feature of Access—primary key.

'A primary key is a field or a combination of fields that uniquely identifies a row. The field that should be set as the primary key cannot have duplicate values. Consider that you have a database of an organization with its employees' details. In this example, the Employee id field can be set as the primary key as no two employees can have the same id,' explains Mr Juneja to Sanya.

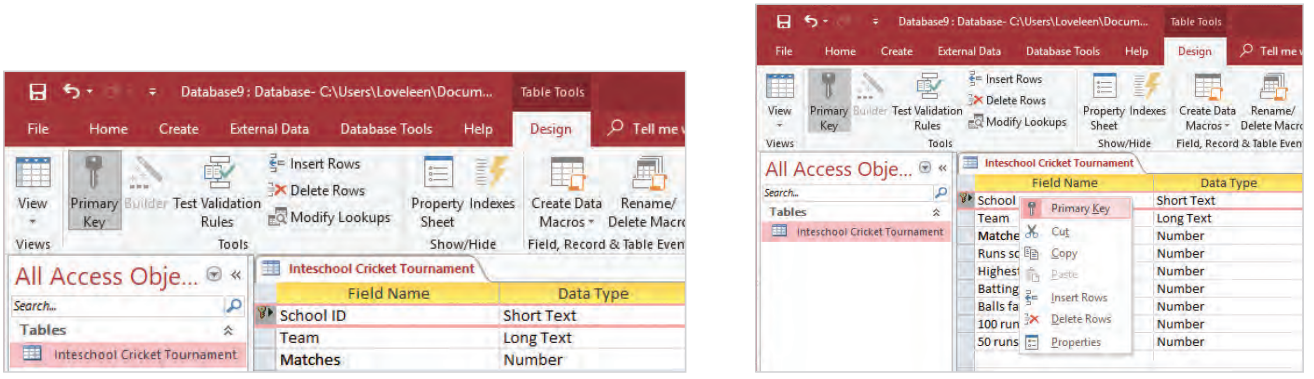
Setting a primary key

Sanya now knows what a primary key is. Mr Juneja guides him through the following steps to set a primary key.

1. In the **Design** view, click on the field that you want to set as the primary key. The selected field gets highlighted.
2. Click on the **Primary key** command in the **Tools** group.

   Or

   Right-click on the field and select the **Primary key** option from the context menu. The field will be set as the primary key, and a small key icon will appear on its left.
3. Save the changes done in the table.



a) b)

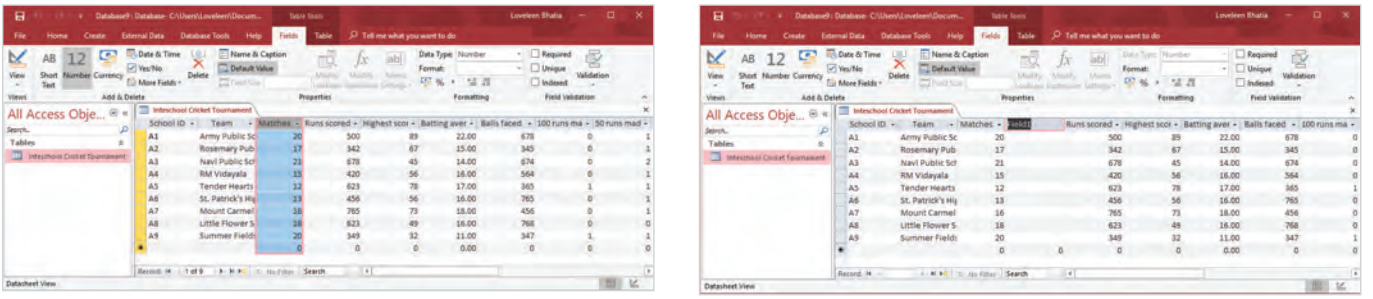
Fig. 4.9 Setting the primary key

Modifying Tables in Access

Mr Juneja continues to explain to Sanya more about Access. He tells her that she can modify a table by inserting, deleting, moving, and hiding fields in the table. He demonstrates the steps to her one by one as described below.

Adding or Deleting a Field

1. Click on the column header to the right of which you want to insert a new field.
2. In the **Add & Delete** group on the **Fields** tab, click on the desired data type command. A new field gets inserted.



a) b)

Fig. 4.10 Inserting a field

3. To delete a field, select it and click on the **Delete** command in the **Add & Delete** group.
4. A message box appears. Click **Yes** to permanently delete the files.

Moving a Field

1. Click on the column header that you want to move.
2. Drag the header to the left or right. Release the mouse button after choosing the correct position.

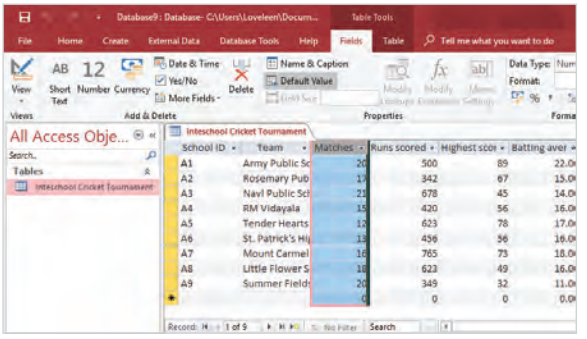


Fig. 4.11 Moving a field

Hiding a Field

1. Click on the column header that you want to hide. To select multiple columns, press the Shift key.
2. Locate the **Records** group on the **Home** tab. Click on the **More** command and then select the **Hide Fields** option.
3. To unhide the fields, click on the **More** command and select the **Unhide Fields** option. The **Unhide Columns** dialogue box opens. You can check the boxes you want to make visible.

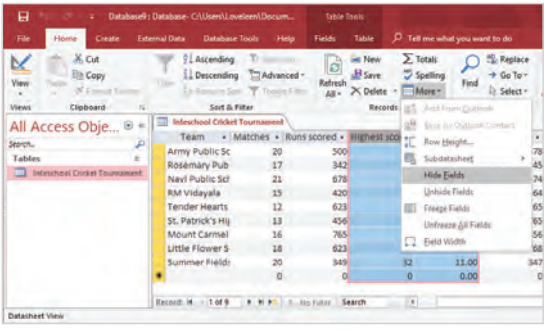


Fig. 4.12 Hiding a field

Changing a Field's Format

1. Click on the column header that you wish to format.
2. In the **Formatting** group on the **Fields** tab, click on the down arrow next to the **Format:** box.
3. Select the desired format from the menu.

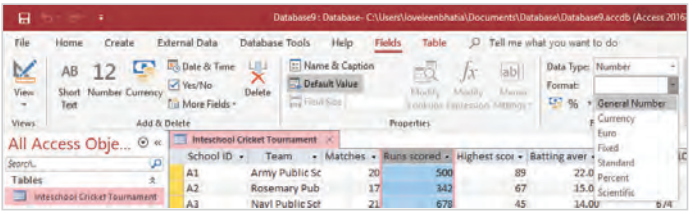


Fig. 4.13 Changing field's format

Working on Data

Mr Juneja tells one more important and interesting feature of Access to Sanya. He tells her that just like Excel, she can carry out calculations in Access also. He explains to her the procedure to perform calculations and sort and filter data.

Calculations in Datasheet View

1. Open the database.
2. Click on the **Home** tab. Locate the **Records** group, and click on the **Totals** command.
3. The **Total** row appears at the bottom of the datasheet. Click on the field where you need to show the results, and then click on the drop-down arrow to choose another function. You can select the Average, Maximum, or Minimum functions from the list.

Fig. 4.14 Records group

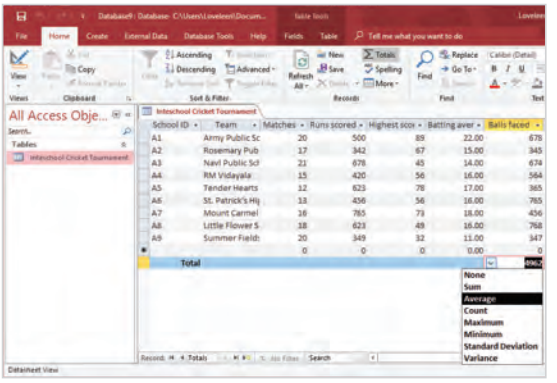


Fig. 4.15 Selecting a function

Sorting Data Within a Table

1. Select the field that you want to sort.
2. Right-click on the field and select either the **Sort Oldest to Newest** or **Sort Newest to Oldest** option.

Or

Click on the drop-down arrow next to selected field header.

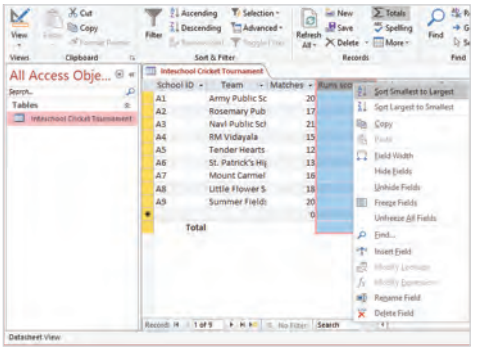


Fig. 4.16 Sort options

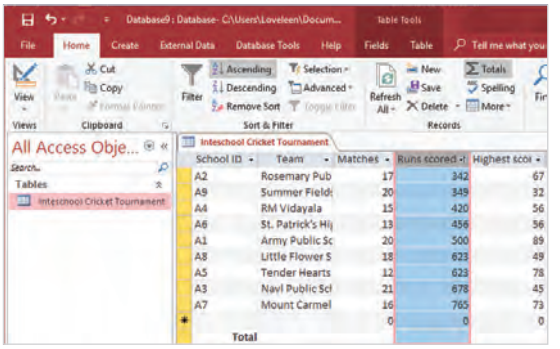


Fig. 4.17 Data sorted in ascending order

3. To remove sorting, click on the **Remove Sort** command in the **Sort & Filter** group on the **Home** tab.

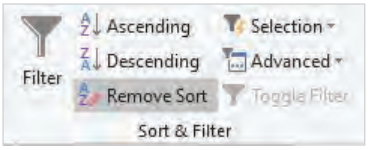


Fig. 4.18 Sort & Filter group

Filtering Data

Mr Juneja asks Sanya to show only those records where number of matched played is greater than 20.

'It is like filtering the data as we do in Excel,' says Sanya.

'Yes, you are right!' says Mr Juneja.

He then guides Sanya through the following steps.

1. Click on the arrow to the right of the column you want to apply filter to. For example, click on the arrow to the right of the **Matches** column header.
2. Clear the **Select All** check box. Now select the value that you want to display. Let's say, 20.
3. Click on **OK**. The rows with the selected value will be displayed.

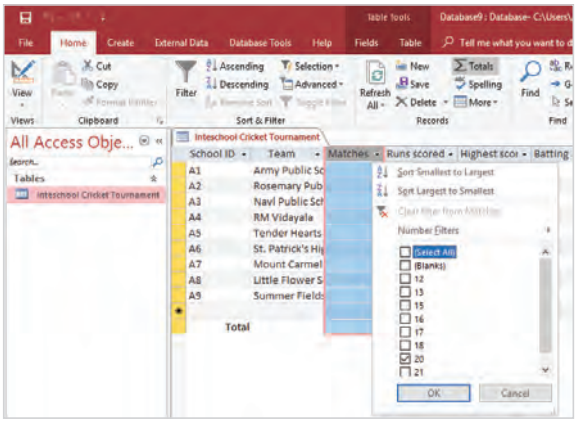


Fig. 4.19 Filter option

Advanced Filtering in a Datasheet

Mr Juneja tells Sanya that Custom Filtering is similar to the multilevel sorting feature of Excel. He guides her through the following steps.

1. Make sure there are no filters applied in that view. To clear all filters, go to **Home** tab and under **Sort & Filter** section, click on **Advanced**, and then click on **Clear All Filters**.

2. Select the field on which you want to apply the filter and click the arrow next to it.
3. Point to the **Number Filters** option, and select the criteria of the filter.
4. The **Custom Filter** dialogue box opens. Type in the desired value, and then click on **OK**.

Quick Tip

You can also remove a filter by clicking on the Toggle Filter command in the Sort & Filter group.

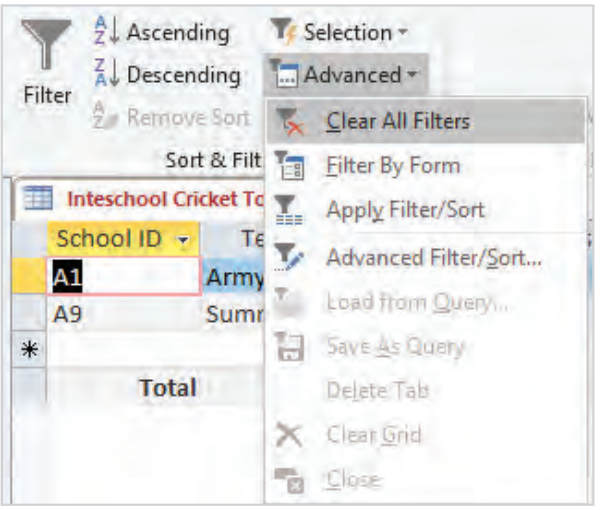


Fig. 4.20 Clear All Filters option

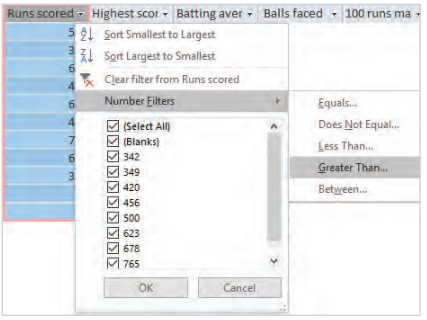


Fig. 4.21 Number Filters option

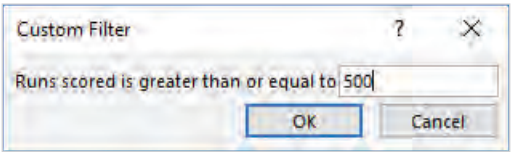


Fig. 4.22 Custom Filter dialogue box option

The rows that match the criteria will now be displayed.

Mr Juneja sums up, 'Advanced filters are expressions called Queries.'

Sanya exclaims, 'Hey! These expressions are similar to the formulas of Excel.'

Remember

Press Alt + F8 keys to view the field pane.

Closing Access Application

It is time to close Access. Sanya saves her work by clicking on the **Save** button on the **Quick Access Toolbar**. The file gets saved with a '.accdb' extension. She then clicks on the **Close** button to close Access window directly.

Her father tells her that she can also close MS Access by using the steps listed below.

1. Click on **File** button. The Backstage menu appears.
2. Select the **Close** option.

Fig. 4.23 Close option

Did You Know?

You can search data in Access by typing in the keyword, phrase, date, or number in the Search bar, which is located at the bottom of the window.

Key Terms

Database	A well-organized collection of data or information
DBMS	A software program that enables us to store, retrieve, analyze, and update information from a database
Field	A column in a table
Record	A row in a table
Primary key	A single or a combination of fields that uniquely identifies a record in a table
Design view	A view used to design the database
Datasheet view	A view that displays the table in a grid of rows and columns

Recap

- A database is an organized collection of data and information.
- A database -management system is a type of application software that provides ways to access, update, analyze, and retrieve data in a database.
- Microsoft Access is a DBMS application. It stores data in the form of a table.
- Tables organize data in a tabular manner. Rows are called records, and columns are called fields.

- There are different objects in MS Access. Some of these are tables, queries, forms, reports, and macros.
- There are two views in Access—Datasheet view and Design view.
- The data type of the field determines what type of data we can enter the field.
- A field property defines the characteristics of the field.
- A primary key is the unique key that cannot contain duplicate values.
- We can perform calculations, apply sorting, and filter data in Access.

Exercise

A. Choose the correct options.

1. Which of the following objects lets you retrieve data based on a given criteria?

   a) Form b) Query c) Macro d) Table

2. What is the maximum number of characters the Short Text data type can store?

   a) 259 b) 254 c) 255 d) 256

3. Which of the following is not a valid data type in Access?

   a) Currrency b) Number c) Long text d) Long number

4. What is the default extension of MS Access file?

   a) .aacdb b) .accdb c) .aaccdb d) .acddb

5. Which of the following statements is true?

   a) A table may or may not have a primary key.

   b) A combination of two fields makes a primary key.

   c) A primary key uniquely identifies a record.

   d) A primary key can be repeated.

B. Fill in the blanks.

1. The field that uniquely identifies a record is called _____.
2. The _____data type generates a unique number whenever a new row is added.
3. A field name can be 1 to _____characters long.
4. The _____data type is used to store the currency values.
5. A _____is used to automate the tasks that are repeatedly used.

C. State *true* or *false*.

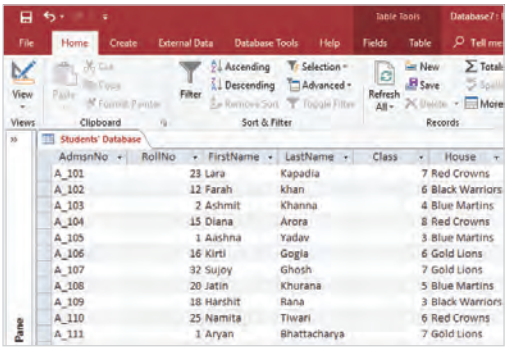
1. A field name can have a period.
2. The fields in the table are represented as rows.
3. If a record is deleted, its AutoNumber value is reused.
4. It is not possible to change a field's format.
5. To switch between the views, click on the View command in the Views group.

D. Answer the following questions.

1. What is a database?
2. What is DBMS?
3. Differentiate between the Design view and Datasheet view.
4. What are data types? Explain any five data types available in Access.
5. Mention the steps to sort the data in Access.
6. How can you filter the data in Access? Mention the steps.

Application-based Questions

1. How do you think database was processed in early times?
2. Look at the database design given below created by Asmita. She needs help to work on this database.



Help Asmita carry out these tasks.

a) Which field will be set as the primary key?

b) How will you sort data in the ascending order?

c) Show only those records whose house is Blue Martins.

Lab Activity

1. Create a database in Access, and save it as EmpDetails. Add a table to it with the following data fields.

Field name	Field type
EmpID	Text
FirstName	Text
LastName	Text
Address	Text
DOJ	Date
DOB	Date
Email	Text
ContactNo	Number

Add data to the table. Set EmpID field as the primary key.

2. Create a database for the students of your class. It should contain the details of all the students, including their student id, phone number, address, date of birth, mode of transport. After creating the database, do the following tasks:
   a) Find out the total number of students who use bus as the mode of transport.
   b) Sort their names in the ascending order.

Project

Make a list of 15–20 countries with the following details.

- Name
- Capital
- Languages spoken
- Currency
- Calling Code
- Major tourist attractions (list any 2–3)
- Area

Now enter the data in Access. Save the database for future references.

Explore More

- Find out the field properties associated with the data types.
- Explore how database is different from Excel.

Work Wisely

Choose the smallest data type that can store and represent the data correctly. It is because smaller data types occupy less space in memory.

Weblinks

- https://cs.ulb.ac.be/public/_media/teaching/infoh303/dbmsnotes.pdf
- https://beginnersbook.com/2015/04/dbms-tutorial/

Notes for the Teacher

- Discuss the advantages of database and DBMS.
- Discuss the importance of primary key.

5 Working with Query, Form, and Report

After going through this chapter, you will be able to—

- **set** relationship between tables;
- **create** a query and format it;
- **create** a form and format it; and
- **format** a report and export it.

In the previous chapter, Sanya learnt about database and got introduced to the widely used database-management system around the world—Access.

In this chapter, you will see how Sanya learns more about setting relationships between tables, creating a query, creating and formatting a form, and exporting it.

Sanya creates a new database for her collection of books. She uses various features of Access, such as sorting and filtering. She goes to her brother, Sameer, who studies in class 12. She shows her database and asks him to tell more about Access. Sameer is amazed at seeing the well-organized database.

Query

'Do you know what a query is?' asks Sameer.

'Yes, it is a method of retrieving data from a table or set of tables,' replies Sanya.

'That's correct, Sanya. To find the list of students whose names start with "S" is a query. Let me explain to you the methods of creating a query in Access,' says Sameer.

Creating a Query

'There are two ways to create a query—using the **Query Wizard** and through the **Query Design**. A query can be saved in a database and can be run any time again in the future,' tells Sameer.

Using Query Wizard

He first teaches Sanya the steps to create a query using the Query Wizard as follows.

1. Open a database, and click on the **Create** tab.
2. Locate the **Queries** group, and click on the **Query Wizard** button.

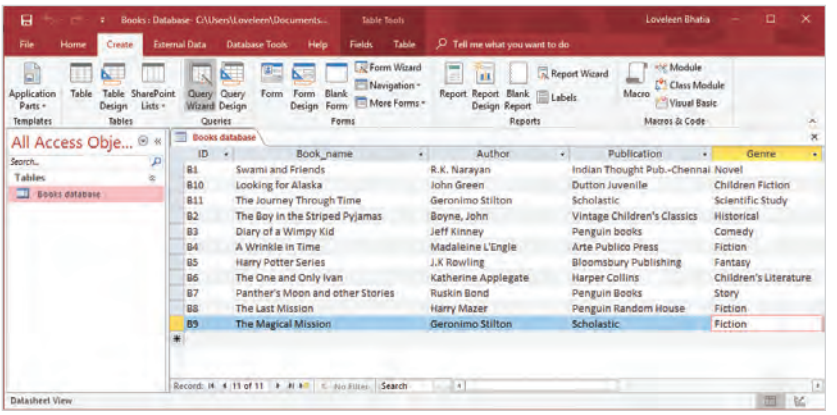


Fig. 5.1 Query Wizard command

3. The **New Query** dialogue box opens. Select the **Simple Query Wizard** option, if not already selected. Click on **OK**.

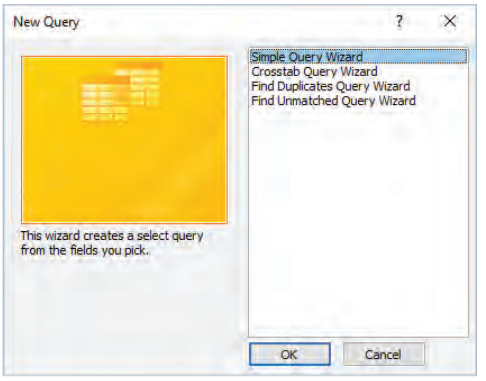


Fig. 5.2 New Query dialogue box

4. The **Simple Query Wizard** dialogue box appears. Select the table from the drop-down list under the **Table/Queries** box.

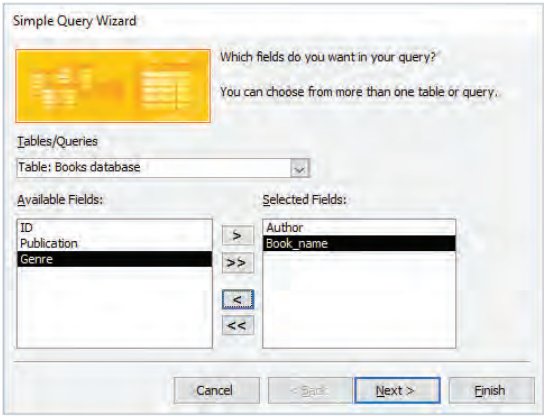


Fig. 5.3 Simple Query Wizard: screen 1 of 3

Now add the fields that you wish to see in the query results.

- To add a field, click on the single arrow forward button **>**.

- The selected field shifts to the **Selected Fields:** box.
- To add all the fields, click on the double arrow forward button >>
- To remove a selected field, click on the single arrow backward button <.

5. After selecting all the required fields, click on the **Next** button.
6. Screen 2 of 3 of **Simple Query** Wizard appears. Select **Detail** or **Summary**, and click on **Next**.
7. Screen 3 appears. Type the name of the query in the text box, select **Open the query to view information**, and then click on **Finish**.

Quick Tip

To remove all the fields in one go from the Selected Fields: box, click on the double arrow backward button <<.

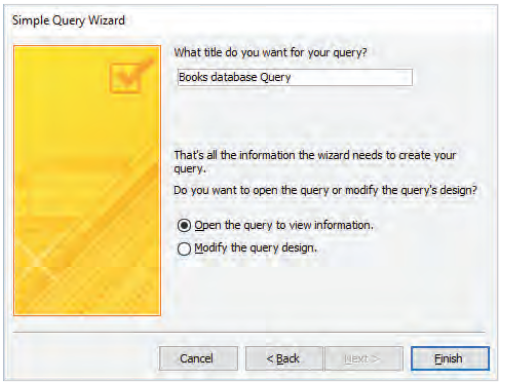


Fig. 5.4 Simple Query Wizard: screen 3 of 3

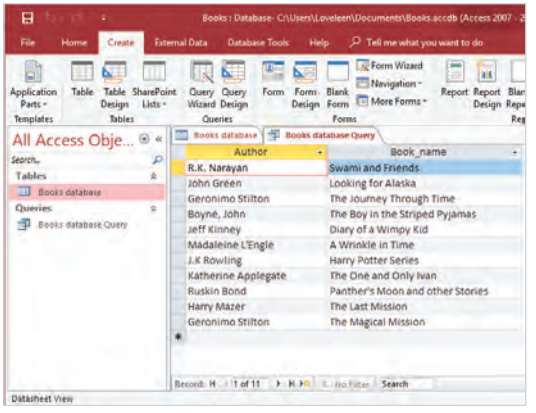


Fig. 5.5 Output of query

The query result will appear in the Datasheet view.

Using Query Design

Sameer then describes the steps to create a query through Query Design.

1. In the **Queries** group on the **Create** tab, click on the **Query Design** button. The **Show Table** dialogue box appears.

Fig. 5.6 Show Table dialogue box

2. Choose a table you want to use and then click on **Add** or double-click the table. To add more related tables, repeat this step.
3. Click on **Close** after adding all the tables. The **Query Design** screen appears.

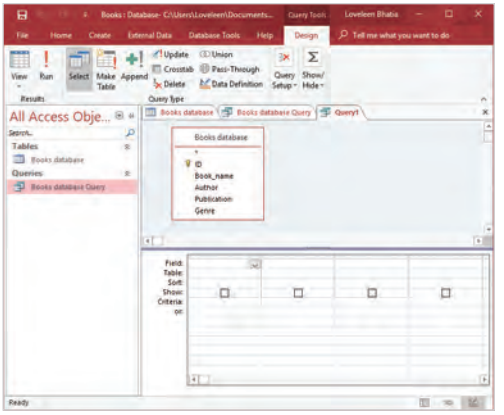


Fig. 5.7 Query Design Grid

4. Select the fields that are to be included by one of the following ways:
   - Double-click the field. It will appear in the first column of the grid.

   Or

   - Drag the field to the required column.

   Or

   - Type the field name directly in the required column in the grid.

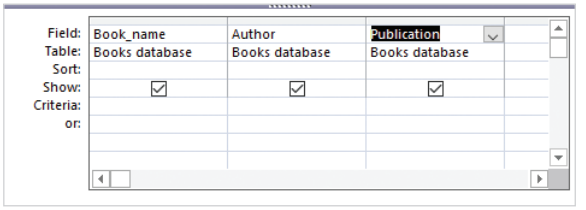


Fig. 5.8 Fields added to the Query Design Grid

5. To include all the columns of the table, double-click on the asterisk.
6. Drag or drop the columns to arrange the fields.
7. Clear the **Show checkbox** to hide one or more columns.

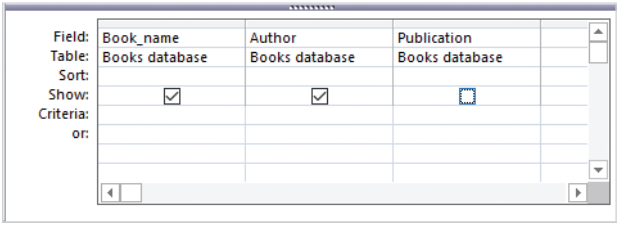


Fig. 5.9 Hiding a field in the Query Design Grid

8. Select the **Sort** field to sort the data either in the ascending or descending order.

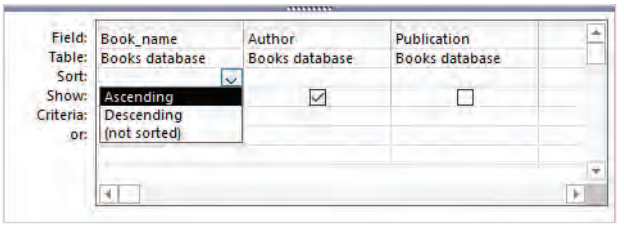


Fig. 5.10 Sorting a field in the Query Design Grid

9. Type in the required condition in the **Criteria** box. Sameer types 'J.K Rowling' as the required condition.

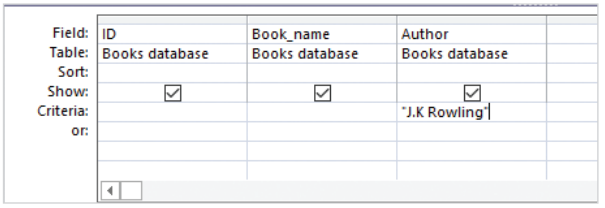


Fig. 5.11 Applying a criteria in the Query Design Grid

Quick Tip

To find data that matches a particular pattern, use the Like criteria. For example, to find the names of the books that start with 'A', type 'Like "A*"'.

10. Click on the **Run** command in the **Results** group to run the query.

The query result displays the ID and name of the book by the author 'J.K Rowling'.

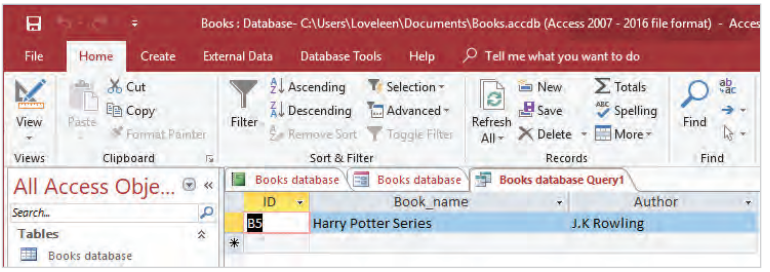


Fig. 5.12 Query result

Saving a Query

'You should save the query for future references,' Sameer asks Sanya.

Sanya follows the steps as given below.

1. She clicks on the **File** tab and selects the **Save** option.
2. The **Save As** dialogue box appears (if a query is saved for the first time). She types in the name for the query and clicks on **OK**.

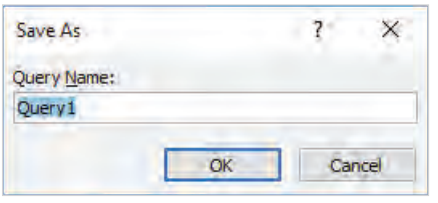


Fig. 5.13 Save As dialogue box

Forms

'Sanya, what do you understand by form?' asks Sameer.

Sanya replies that a form is a document with some blank fields wherein we fill the desired information. Sanya also creates a form to save time because forms make it easier to input the data in one or more tables.

A form is a database object that can be used to create a user interface for a database application.

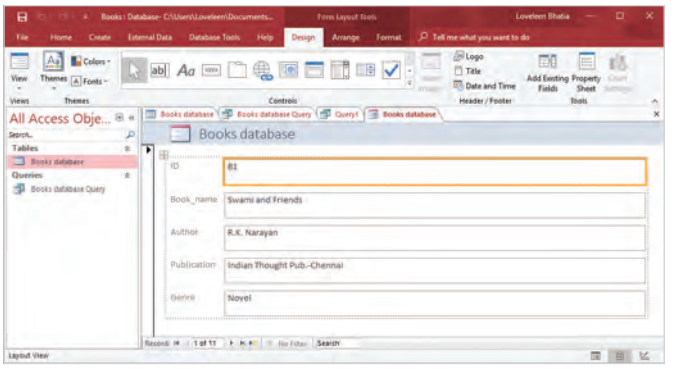


Fig. 5.14 Creating a form using the Form command

Creating a Form

Sanya follows the given steps as told by Sameer to create a form.

1. She goes to the **Create** tab and clicks on the **Form** command in the **Forms** group.
2. It creates a form with all the fields in the **Layout View**.
3. Three new tabs—**Design**, **Arrange**, and **Format**—appear on the ribbon under the **Form Layout Tools** contextual tab.
4. To enter or edit data in the form, click on the **Home** tab and locate the **Views** group.
5. Select the **Form View** option by clicking on the **View** command.
6. Save the data by clicking on the **Save** button on the **Quick Access Toolbar**.

Formatting a Form

Sameer tells Sanya that it is also possible to format a form and there are two ways to do this. One way is by using the **Design** tab, and the other is by using the **Format** tab.

Using Design Tab

1. Click on the **Logo** command in the **Header/Footer** group on the **Design** tab.
2. The **Insert Picture** dialogue box appears. Select the desired image and click on **OK**.
3. Click on the **Title** command in the **Header/Footer** group. Type in the title for the form.
4. To insert date and time, click on the **Date and Time** command in the **Header/Footer** group. The **Date and Time** dialogue box appears. Choose the required format of date and time, and click on **OK**. The **Date and time** placeholders appear in the Header section of the form.

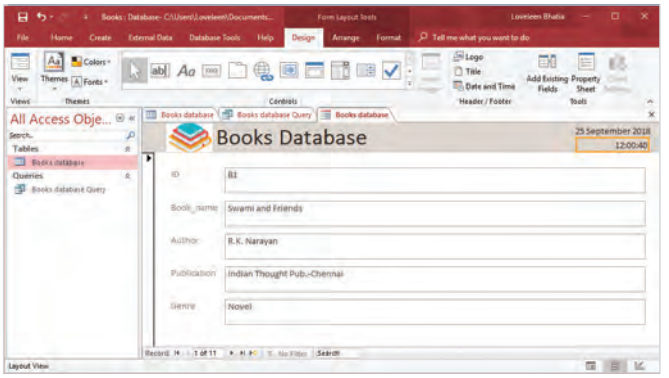


Fig. 5.15 Creating a form using the Form command

Quick Tip

To set a background image in the form layout, follow these steps:

1. Click on the Background Image drop-down button in the Background group on the Format tab.
2. Click on the Browse button. The Insert Picture dialogue box opens.
3. Choose the location and select the desired image.
4. Click on the Open button. The image will be set as the background image.

Using Format Tab

1. In the **Conditional Formatting** group, click on the **Conditional Formatting** command. The **Conditional Formatting Rules Manager** dialogue box opens.

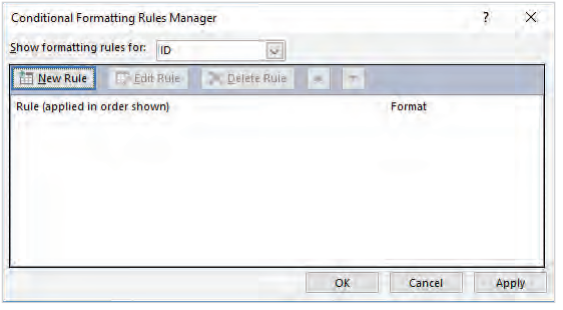


Fig. 5.16 Conditional Formatting Rules Manager

2. Click on the **New Rule** button. The **New Formatting Rule** dialogue box appears. Under the **Select a rule type:** field, select **Check values in the current record or use an expression**. Under the **Edit the rule description:** field, select the rule, apply the desired formatting, and click on **OK**.

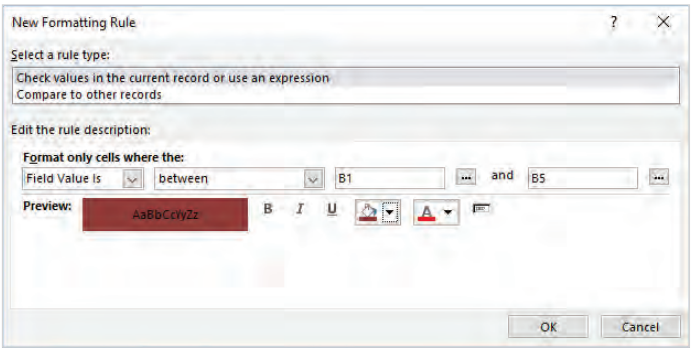


Fig. 5.17 New Formatting Rule

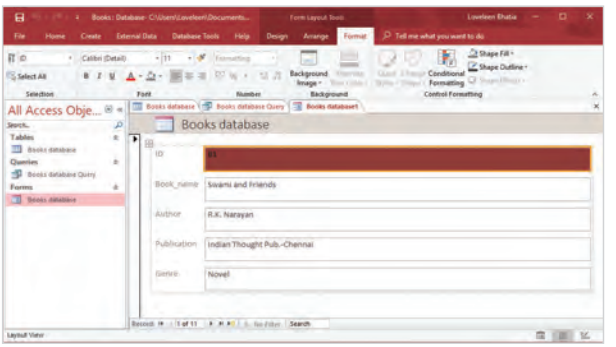


Fig. 5.18 Formatted form

Checkpoint

State true or false.

1. A query refers to an object that helps to display a data in a much presentable and organized manner.
2. All the saved queries are shown under the Navigation pane.
3. The Form command is available under the Create tab.
4. Forms can be formatted using various options present under the Design tab.
5. A form is used to create a user interface for a database application.

Reports are a great way to organize and summarize the information present in the database. They can be created from one or more tables or queries. Each time a report is opened, Access displays the most recent data. You can find all the previously saved reports in the Navigation pane on the left.

Creating a Report

Sameer tells Sanya that she can create a report the same way as she has created a form. Sanya quickly clicks on the **Create** tab and then clicks on the **Report** command in the **Reports** group. All the fields of the table are represented in the report.

Sanya notices that four new tabs—**Design**, **Arrange**, **Format**, and **Page Setup**—appear under the **Report Layout Tools** contextual tab. She saves her report by clicking on the **Save** button on the **Quick Access Toolbar**.

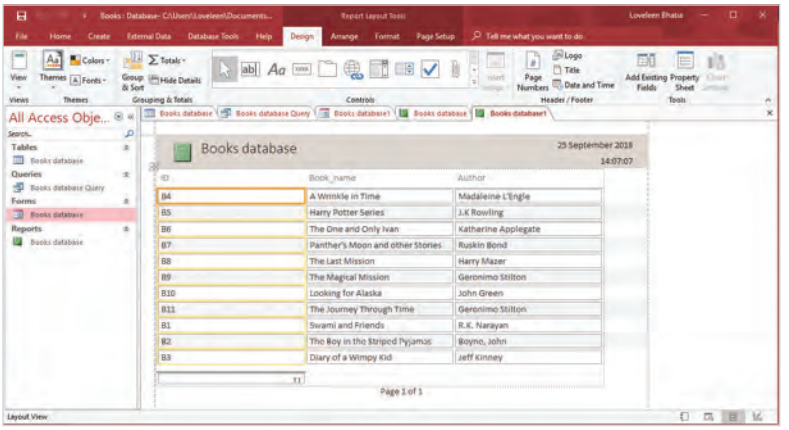


Fig. 5.19 Creating a report

Creating a Report Using the Report Wizard

'There is one more way to create a report,' says Sameer.

'I know, it is using the **Report Wizard**. I saw this command in the **Reports** group,' replies Sanya.

She then follows these steps to create a report.

1. She clicks on the **Report Wizard** command.
2. **Report Wizard** screen 1 of 5 appears. She selects the desired table from the **Tables/Queries** drop-down menu and the required fields from the **Available Fields:** menu. She then clicks on **Next**.
3. **Report Wizard** screen 2 of 5 appears. She selects the fields to add them to the grouping level within the report and clicks on **Next**.

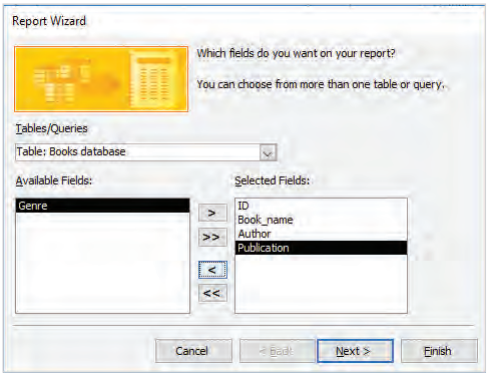


Fig. 5.20 Report Wizard: screen 1 of 5

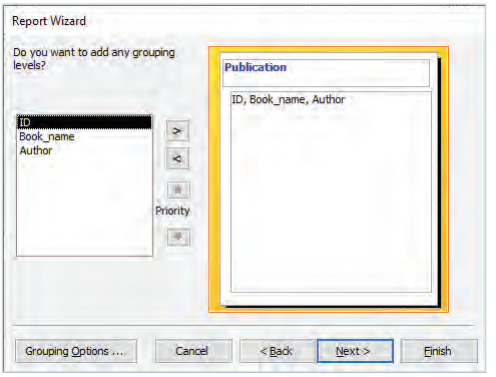


Fig. 5.21 Report Wizard: screen 2 of 5

4. **Report Wizard** screen 3 of 5 appears. She selects the order and summary options. She then clicks on **Next**.

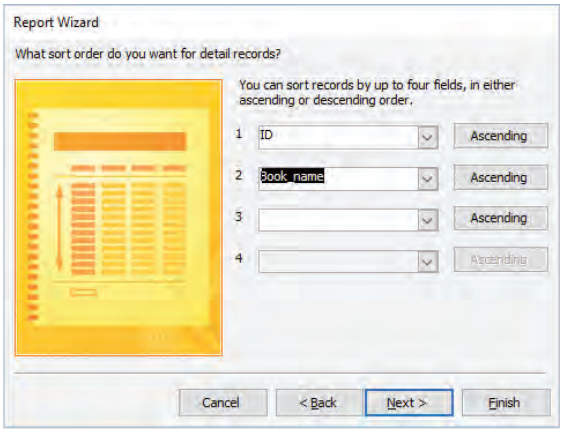


Fig. 5.22 Report Wizard: screen 3 of 5

5. **Report Wizard** screen 4 of 5 appears. She then selects the type of layout under the **Layout** option and clicks on **Next**.

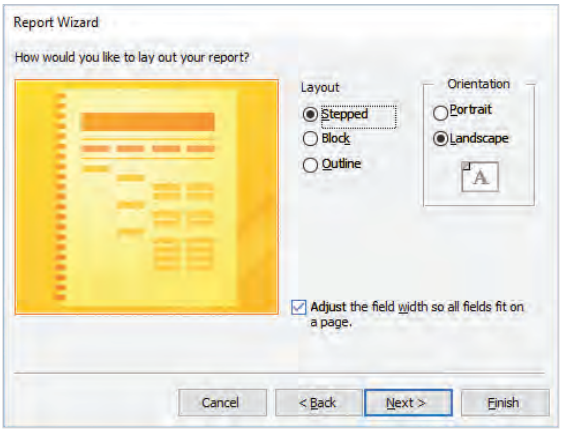


Fig. 5.23 Report Wizard: screen 4 of 5

6. **Report Wizard** screen 5 of 5 appears. She types in a name for the report, previews the report by clicking on the **Preview the report**, and clicks on **Finish**.

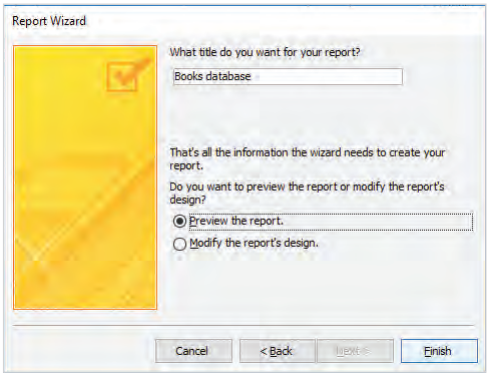


Fig. 5.24 Report Wizard: screen 5 of 5

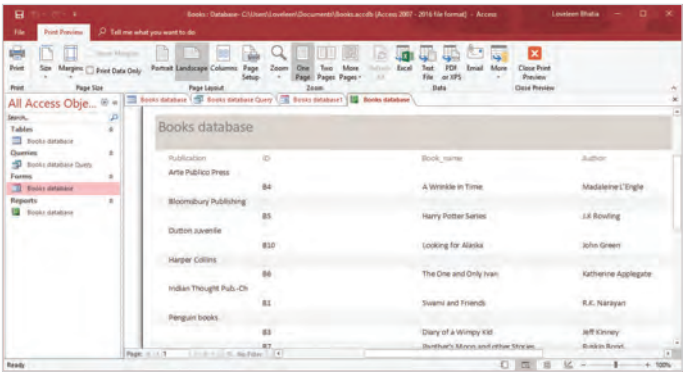


Fig. 5.25 Report created using the Report Wizard

Printing a Report

Sanya follows these steps to print her report.

1. She clicks on the **File** tab, and selects the **Print** option.
2. From the right pane of the window, she selects the **Print Preview** option. The ribbon changes as shown in Fig. 5.26.

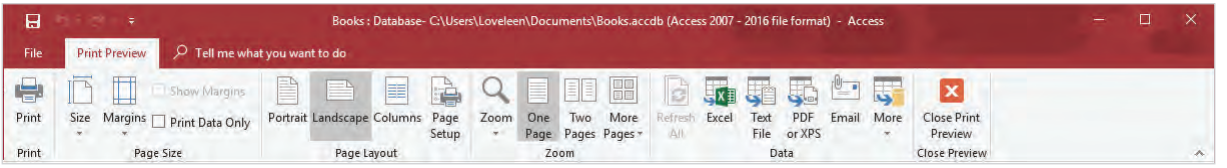


Fig. 5.26 Print Preview tab

3. She chooses the desired options to modify the default settings and clicks on the **Print** command in the **Print** group.

Exporting a Report

Sanya decides to export her report as a PDF. She follows the steps listed below.

1. On the **Print Preview** tab, she clicks on the **PDF or XPS** command in the **Data** group.
2. The **Publish as PDF or XPS** dialogue box opens.
3. She types in the name in the **File name:** dialogue box.

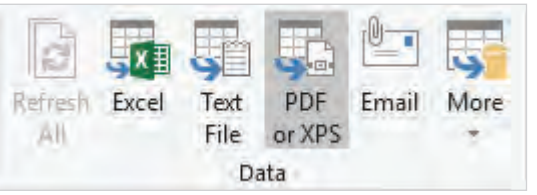


Fig. 5.27 Data group

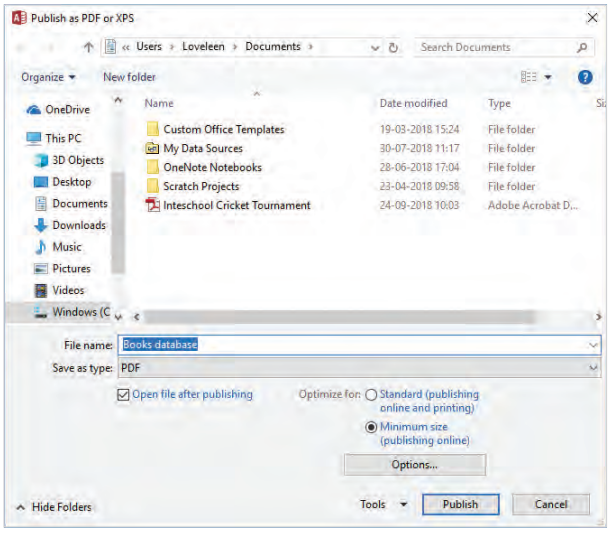


Fig. 5.28 Publish as PDF or XPS dialogue box

Quick Learn

Manas wants to export his report into an Excel file. Can he do so? If yes, then write the steps in detail to help him do so.

4. She then clicks on the **Publish** button. A screen appears notifying her about the completion of the exporting process.

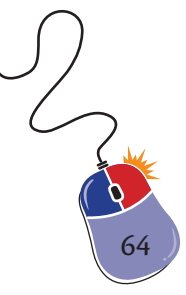
Sameer tells her that she can also choose to export the report as an Excel, Text, or Word file.

Key Terms

Query	A request to get information from a database
Form	A database object used to create a user interface and to input, delete, or edit the data
Report	A database object that organizes and presents data in an easy-to-read and printable format

Recap

- A query is used to retrieve information from a single or combination of database tables.
- In a form, we need to have an object that can be used to create a user interface for a database application.
- Creating a form saves a lot of time because it makes it easier to input the data in one or more tables.
- A report in Access refers to an object which helps to display data in a presentable and organized manner.
- The Create tab has the commands to create a query, form, and report.
- The File tab is used to print the report, and export it as a PDF, Excel, or Word file.



Exercise

A. Choose the correct options.

1. Which of the following commands is not present on the Create tab?

   a) Query wizard b) Table Design c) Form Design d) Logo

2. Which of these is not a valid query view in MS Access?

   a) Datasheet view b) Quick view c) Design view d) SQL view

3. A report cannot be exported as a

   a) Word file. b) PDF file. c) PPT file. d) Excel File.

4. Which of the following commands lets you insert date in a form?

   a) .aacdb b) .Time c) Date & Time d) Time & Date

5. Which of the following buttons will you click to delete a selected field in the Selected Fields box while creating a query?

   a) `>` b) `<<` c) `<` d) `>>`

B. Fill in the blanks.

1. A _____ can be used to summarize the data and perform different calculations with the data.
2. A _____ is a database object that allows you to retrieve information from a table.
3. To create a query, go to the _____ tab.
4. The Run command is present on the _____ tab.
5. The Print Preview command is present on the _____ tab.

C. State *true* or *false*.

1. A query can also be created with the help of multiple tables.
2. The output of the query is displayed after clicking the Display command.
3. The Sort property is used to sort data only in descending order.
4. A form can be saved after creating it.
5. A report can only be exported to a Word document format.

D. Answer the following questions.

1. What is a query?
2. Discuss the steps briefly to create a new query.
3. What is a form in Access? Write the steps to format a form.
4. What is a report in Access?
5. Write the steps to export a report.

Application-based Questions

1. Niharika's father works in the manufacturing department of an automobile company. He has created a database as shown in the image.

Field Name	Data Type	Description (Optional)
Type	Short Text	Specify whether it is a two-wheeler or four-wheeler vehicle
Model_No	AutoNumber	specify the unique model no.
Year_Of_Manufacturing	Date/Time	specify the year of manufacturing
Place_Of_Manufacturing	Short Text	specify the place of manufacturing
Fuel_Type	Short Text	specify the fuel type of the vehicle
Mileage	Number	specify the mileage in number

Help Niharika accomplish the following tasks:

a) Enter 15 records in the table.

b) Display the report grouped by Fuel Type and save it.

2. The class teacher of class 8 has noted down the names of students who wish to participate in the annual day celebrations. She has given the list to Kamya and asked her to create a table in Access.

S_ID	S_Name	Activity
1	Naina	Dancing
2	Diya	Painting
3	Dinesh	Debate
4	Taranjeet	Singing
5	Ajay	Singing
6	Akshay	Dancing
7	Aamir	Debate
8	Ananya	Singing
9	Arushi	Debate
10	Jaya	Dancing
11	Mili	Dancing
12	Dimple	Dancing

a) How will Kamya create a query?

b) How will she display the names of only those students (by creating a query) with S_ID between 1 and 8 and those who are participating in 'Dancing'.

Lab Activity

1. Maahi's mother maintains a database of her employees in the EmpDetails table as shown below. Maahi has shown the table design to his friend Aryan. Help Aryan in doing the tasks given below.

Field Name	Data Type	Description	Possible data values
Emp_ID	Short Text	Employee ID	
Emp_Name	Short Text	Name of the Employee	
DOJ	Date/Time	Date of joining	
DOB	Date/Time	Date of birth	
Department	Short Text	Department name	Editorial, Admin, Finance
Location	Short Text	Place of the office	Delhi, Mumbai, Bangaluru, Chennai

   a) Enter records of at least 15 employees.

   b) Create a form and save it as empform.

   c) Create a query to show all the employees who work in the city 'Chennai'.

2. Rashmi has designed a table in database as shown in the image. Help her in doing the tasks given below

S_ID	S_Name	Class	House	Blood Group
A_121	Sunil	2	Red	A
A-123	Yogesh	4	Green	B
A_187	Azmat	6	Blue	O
A_567	Ojas	7	Red	AB+
A-785	Nidhi	4	Green	A+
A_456	Kamya	5	Blue	O+
A_065	Aditi	6	Red	AB
A_256	Heena	7	Orange	AB
A_378	Sumeet	8	Orange	A+
A_675	Neha	3	Blue	B+

   a) Create a query to display the names of the students along with their ids whose blood group is AB+ in the ascending order of their classes.

   b) Create a report in the descending order of the class and save it.

   c) Create a form to know the class and name of all the students.

Project

It is your birthday next month. Create a database with all the information of your friends whom you wish to invite. The fields should include the name, address, pin code, phone number, mother's name, and father's name. Create a query to display the names and addresses of your friends in the ascending order.

Explore More

Find out the use of the Criteria and Or rows present in the Design Grid of the Query Formatting window. Discuss the use of both in a query in your class.

Work Wisely

Make sure the syntax of the condition used in the Criteria is correct.

Weblinks

- https://www.tutorialspoint.com/ms_access/ms_access_create_form.htm
- https://support.office.com/en-us/article/apply-criteria-to-text-values-202548b6-b065-4387-800b-2456a7099bca

Notes for the Teacher

- Discuss the use of query, form, and report in Access.
- Discuss how to apply the properties such as validation rule and validation text.

6 Lists and Tables in HTML

After going through this chapter, you will be able to—

- **create** ordered, unordered, nested, and description lists and
- **create** a well-structured table.

Satish is a teacher who has a great interest in teaching students and helping them out. He plans to create an e-learning website for class 8 students, which will offer information on a variety of subjects. Satish is good with computers and knows that HTML (Hypertext Markup Language) is the basis for building websites. He plans to do the following using HTML:

- Publish documents and data online with headings, text, tables, lists, and photos.
- Create forms for managing transactions, searching information, making reservations, and ordering products.
- Accommodate spreadsheets, video clips, sound clips, and other applications directly in the documents.

Satish knows well about some of the HTML commands. In order to create a well-structured and easy-to-use website, he decides to ask his friend, Peter, for help. Peter is a web designer and is well versed in designing websites.

Lists in HTML

Peter begins by taking up the first topic 'Lists in HTML'. He explains to Satish that lists can be used to present information in a systematic way. He explains how lists group together the related pieces of information and associate them with each other, which makes it easy for the viewer to read.

He further tells Satish that there are two different types of lists in HTML—unordered list and ordered list. Both of them have a specific purpose and meaning.

Unordered List

An unorderd list is a type of list of items that are not arranged in any specific order. Peter tells Satish about the tags used to create an unordered list.

An unordered list starts with the <ul> tag and ends with the tag. Each list item is marked with <li> and tags.

Peter writes and shows the following HTML program to Satish:

```
<html>
<head></head>
<title> Metals and Non-Metals</title>
<style type="text/css">
body{background-color:#EAEDED}
h1{font size:20px; text-align:center; color:black; margin:30px}
p{font-family:times new roman; font-size:14pt; text-align:justify; margin-left: 20px; margin-right:20px}
hr{margin-left:30px; margin-right:30px; border-width:3px}
h3{font size:14pt; margin-left:30px}
</style>
<body>
<h1> Metals and Non-Metals</h1>
<hr>
<p>We can classify commonly used objects, such as a steel spoon, a piece of aluminium foil, the blade of a knife, pencil lead, sulphur, and a piece of charcoal, into metals or non-metals on the basis of certain common characteristics. For example, the blade of a knife, aluminium foil, and the spoon are all shiny. They can all be easily bent. Also, if we put these objects near a flame or a hot object, the heat easily spreads from one end to the other. The materials which are shiny, flexible, and conduct heat or electricity are classified as metals.
Some examples of metals are: </p>
<ul>
<li>Iron</li>
<li>Aluminium</li>
<li>Copper</li>
<li>Mercury</li>
<li>Zinc</li>
<li>Lead</li>
<li>Gold</li>
<li>Platinum</li>
</ul>
```

```
<p>Substances like coal and sulphur are not shiny and cannot be bent. They may burn but do not conduct heat (or electricity) easily. Such substances are classified as non-metals.</p>
</body>
</html>
```

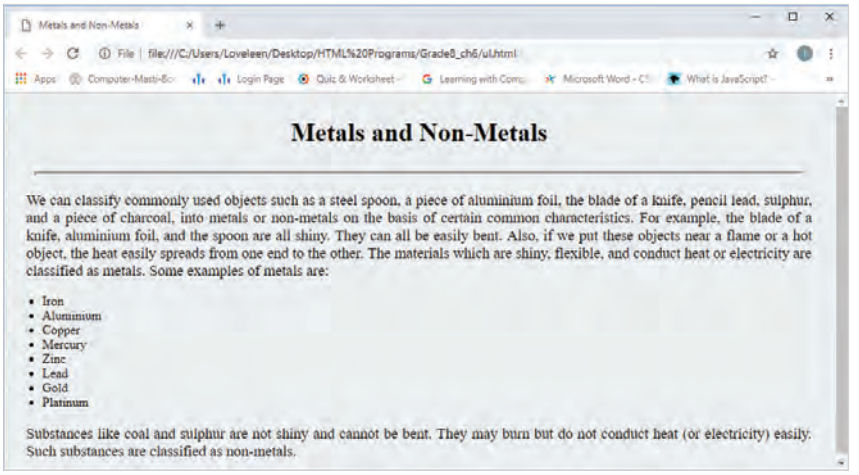


Fig. 6.1 Output of the previous program

Ordered List

Peter tells Satish that an ordered list is a numbered list of items arranged in a specific order.

'In this type of list, the sequence of the list items matters,' he emphasizes.

He then goes on to explain the tags involved with an ordered list.

An ordered list is created using the `<ol>` tag and ends with the `</ol>` tag. Each list item starts with the `<li>` tag that ends with the `</li>` tag.

Satish and Peter then write a program to depict the use of an ordered list.

```
<html>
<head></head>
<title> Metals and Non-Metals</title>
<style type="text/css">
body{background-color:#EAEDED}
h1{font size:20px; text-align:center; color:black; margin:30px}
p{font-family:times new roman; font-size:14pt; text-align:justify; margin:30px 30px 30px}
hr{margin-left:30px; margin-right:30px; border-width:3px}
h3{font size:14pt; margin-left:30px}
ol{margin-left:1em}
</style>
<body>
<h1> Metals and Non-Metals</h1>
<hr>
```

```
<p>We can classify commonly used objects, such as a steel spoon, a piece of aluminium foil, the blade of a knife, pencil lead, sulphur, and a piece of charcoal, into metals or non-metals on the basis of certain common characteristics. For example, the blade of a knife, aluminium foil, and the spoon are all shiny. They can all be easily bent. Also, if we put these objects near a flame or a hot object, the heat easily spreads from one end to the other. The materials which are shiny, flexible, and conduct heat or electricity are classified as metals. Some examples of metals are iron, aluminium, copper, mercury, zinc, tin, lead, gold, and platinum. <br>
Substances like coal and sulphur are not shiny and cannot be bent. They may burn but do not conduct heat (or electricity) easily. Such substances are classified as non-metals.<br> </p>
<h3> Reactivity Series of Metals </h3>
<ol>
<li> Potassium </li>
<li> Sodium </li>
<li> Calcium </li>
<li> Magnesium </li>
<li> Iron </li>
<li> Lead </li>
<li> Copper </li>
<li> Silver </li>
<li> Gold </li>
</ol>
</body>
</html>
```

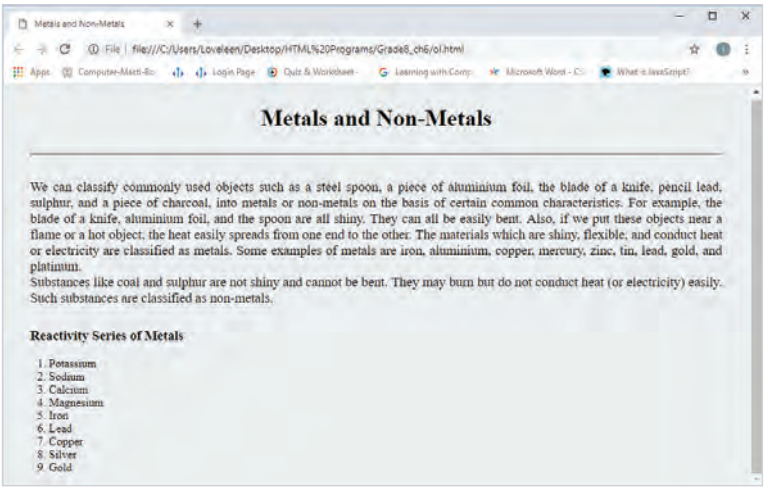


Fig. 6.2 Output of the previous program

Quick Learn

Try and make a web page using ordered and unordered lists of the cities/countries you have visited. The ordered list should show the last visited city at the top.

Did You Know?

HTML accompanied by Hypertext Transfer Protocol (HTTP) was created by Tim Berners-Lee.

Attributes of the <ol> tag

Peter then continues to explain some attributes of the `<ol>` tag. He lists out the attributes as follows:

- **Start**: Used to specify the start value of the first item in the list

  Syntax: `<ol start="value">`

  Here the value can be any integer value. For example, `<ol start=3>` will begin the list from 3.

- **Reversed:** Used to specify the numbering for the list items in the descending order

  Syntax: `<ol reversed>`

- **Type:** Used to specify the bullet or numbering type to mark the list items

  Syntax for Ordered list: `<ol type="value">`

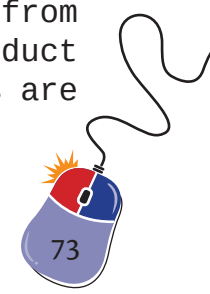
  where the value can be A, a, I, or 1.

  Syntax for unordered list: `<ul type= "value">`

  where the value can be disc, square, or circle

Peter shows to Satish the snippets of the code to make him understand the use of these attributes.

```
<html>
<head></head>
<title> List attributes</title>
<style type="text/css">
body{background-color: #EAEDED}
h1{font size:20px; text-align:center; text-color:black; margin:30px}
p{font-family:times new roman; font-size:14pt; text-align:justify;
margin:30px 30px 30px}
hr{margin-left:30px; margin-right:30px; border-width:3px}
h3{font size:14pt; margin-left:30px}
ol{margin-left:1em}
</style>
<body>
<h1> Metals and Non-Metals</h1>
<hr>
<p>We can classify commonly used objects such as a steel spoon, a piece of
aluminium foil, the blade of a knife, pencil lead, sulphur, and a piece
of charcoal, into metals or non-metals on the basis of certain common
characteristics. For example, the blade of a knife, aluminium foil, and
the spoon are all shiny. They can all be easily bent. Also, if we put
these objects near a flame or a hot object, the heat easily spreads from
one end to the other. The materials which are shiny, flexible, and conduct
heat or electricity are classified as metals. Some examples of metals are
```



```
iron, aluminium, copper, mercury, zinc, tin, lead, gold, and platinum.<br>
Substances like coal and sulphur are not shiny and cannot be bent. They
may burn but do not conduct heat (or electricity) easily. Such substances
are classified as non-metals.<br>
<h3> Reactivity Series of Metals from Least Reactive to Most Reactive
</h3>
<ol reversed>
<li> Gold </li>
<li> Silver </li>
<li> Copper </li>
<li> Lead </li>
<li> Iron </li>
<li> Magnesium </li>
<li> Calcium </li>
<li> Sodium </li>
<li> Potassium </li>
</ol>
</p>
</body>
</html>
```

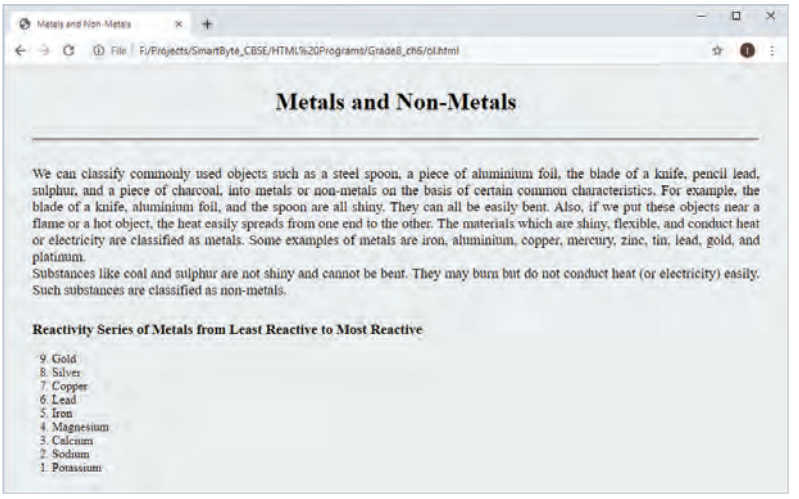


Fig. 6.3 Output of the previous program

List Properties

Peter now starts explaining the list properties for ordered and unordered lists to Satish.

- **List-style-type:** Used to define the style of the list-item marker

  Syntax: list-style-type:value

  Here the value for the unordered list can be none, disc, circle, or square and the value for the ordered list can be roman, upper-roman, decimal, or decimal-leading-zero.

  'Disc' and 'decimal' are the default values for the unordered and ordered lists respectively.

- **List-style-position:** Used to specify the position of the list-item markers

  Syntax: list-style-position:value

  Here the value can be inside or outside.

- **List-style-image:** Used to set an image as the list-item marker

  Syntax: list-style-image:value

  Here the value is the url (path of the location where the image is stored on the computer) of the image or none.

- **List-style:** Used to define all the properties for a list in one declaration

  Syntax: list-style-type list-style-position list-style-image

'Let us use these properties and modify our previous program,' says Satish.

'Yes, sure! Satish,' replies Peter.

```
<html>
<head></head>
<title> List Properties</title>
<style type="text/css">
body{background-color:#EAEDED}
h1{font size:20px; text-align:center; text-color:black; margin:30px}
p{font-family:times new roman; font-size:14pt; text-align:justify; margin:
30px 30px 30px}
hr{margin-left:30px; margin-right:30px; border-width:3px}
h3{font size:14pt; margin-left:30px}
ol{margin-left:1em;       list-style-type:upper-roman;       list-style-
position:inside}
</style>
<body>
<h1> Metals and Non-Metals</h1>
<hr>
<p>We can classify commonly used objects such as a steel spoon, a piece of
aluminium foil, the blade of a knife, pencil lead, sulphur, and a piece
of charcoal, into metals or non-metals on the basis of certain common
```

```
characteristics. For example, the blade of a knife, aluminium foil, and the spoon are all shiny. They can all be easily bent. Also, if we put these objects near a flame or a hot object, the heat easily spreads from one end to the other. The materials which are shiny, flexible, and conduct heat or electricity are classified as metals. Some examples of metals are iron, aluminium, copper, mercury, zinc, tin, lead, gold, and platinum. <br>
Substances like coal and sulphur are not shiny and cannot be bent. They may burn but do not conduct heat (or electricity) easily. Such substances are classified as non-metals.<br>
<h3> Reactivity Series of Metals</h3>
<ol>
<li> Potassium </li>
<li> Sodium </li>
<li> Calcium </li>
<li> Magnesium </li>
<li> Iron </li>
<li> Lead </li>
<li> Copper </li>
<li> Silver </li>
<li> Gold </li>
</ol>
</p>
</body>
</html>
```

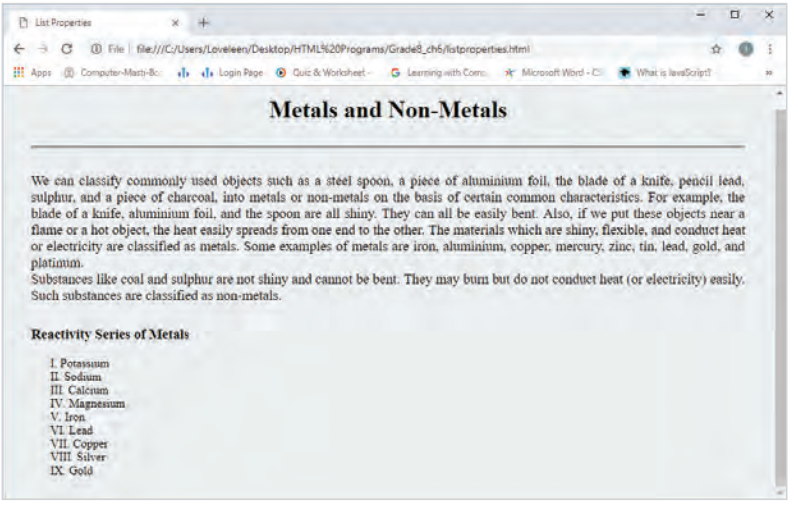


Fig. 6.4 Output of the previous program

Nested List

Next, Peter goes on to explain the nested list. He explains how sometimes the data we enter or the list we make has some further sub-topics inside it. For representing them, we use lists inside lists. Such lists inside another list are called nested lists or embedded lists. The list in which they are nested (or embedded) is known as the parent list.

Satish then writes a program to depict the usage of the nested list.

```
<html>
<head></head>
<title> Agricultiral Practices</title>
<style type="text/css">
body{background-color:#EAEDED}
h1{font size:20px; text-align:center; color:green; margin:30px}
p{font-family:times new roman; font-size:13pt; text-align:justify; margin-left:20px; margin-right:20px}
hr{margin-left:30px; margin-right:30px; border-width:3px}
h3{font size:14pt; margin-left:30px}
ul{list-style-type:square}
</style>
<body>
<h1> Agricultural Practices</h1>
<hr>
<p>Cultivation of crops is not a single-step process. To cultivate crops, the farmers are required to perform several tasks or activities. These activities are spread over a period of time and are known as agricultural practices. These practices include:</p>
<ol>
<li>Preparation of soil</li>
The very first step in growing a crop is soil preparation. Soil preparation refers to the processing of soil before sowing the seeds. It includes turning the soil, loosening it, and breaking large lumps into fine soil. The process of loosening and turning the soil is called tilling or ploughing.
Various tools or implements are used in the preparation of soil. These are:
<ul>
<li>Plough</li>
<li>Cultivator</li>
<li>Hoe</li>
```

```
<li>Leveller</li>
</ul>
<li>Sowing</li>
<li>Improving soil fertility</li>
<li>Irrigation</li>
<li>Protection from weeds</li>
<li>Harvesting</li>
</li>Storage</li>
</ol>
</body>
</html>
```

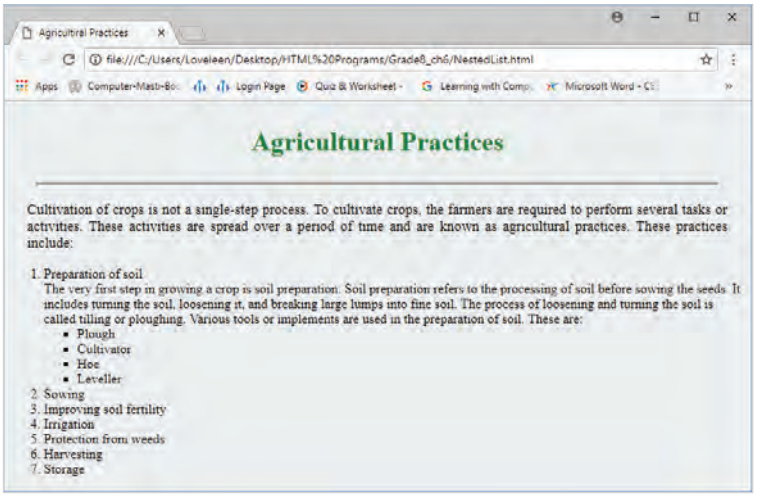


Fig. 6.5 Output of the previous program

Description List

'Let me now introduce you to the next list type, called description list, and its tags,' says Peter.

Peter then explains that a **description list** is also known as a **definition list.** It is used to create a list with its description, just like word meanings. There are three different tags used to create a description list. These are as follows:

- **Description list** `<dl>` **tag**—used to define a description list
- **Definition list term** `<dt>` **tag**—used to define a term in the list
- **Definition list description** `<dd>` **tag**—used to display the description of the term defined

'Let me write a program to show you the usage of the description list,' says Peter. He then writes the following program.

```
<html>
<head></head>
<title> Definition list</title>
<style type="text/css">
```

```
body{background-color:#EAEDED}
hr{margin-left:30px; margin-right:30px; border-width:5px}
dt{margin-left:30px;margin-right:30px;font-family:Calibri;color:orange}
dd{font-size:13pt; font-family:Calibri}
h1{margin-left:30px}
</style>
<body>
<h1>Word Bank</h1>
<hr>
<dl>
<dt>Ploughing</dt>
<dd>The process of loosening and turning the soil</dd>
<dt>Sowing</dt>
<dd>The process of planting seeds in the prepared soil</dd>
<dt>Fallowing</dt>
<dd>The process of leaving soil uncultivated for one cropping season</dd>
<dt>Irrigation</dt>
<dd>Supply of water to crops at appropriate intervals for cultivation</
    dd>
<dt>Weeding</dt>
<dd>The process of removing weeds</dd>
</dl>
</body>
</html>
```

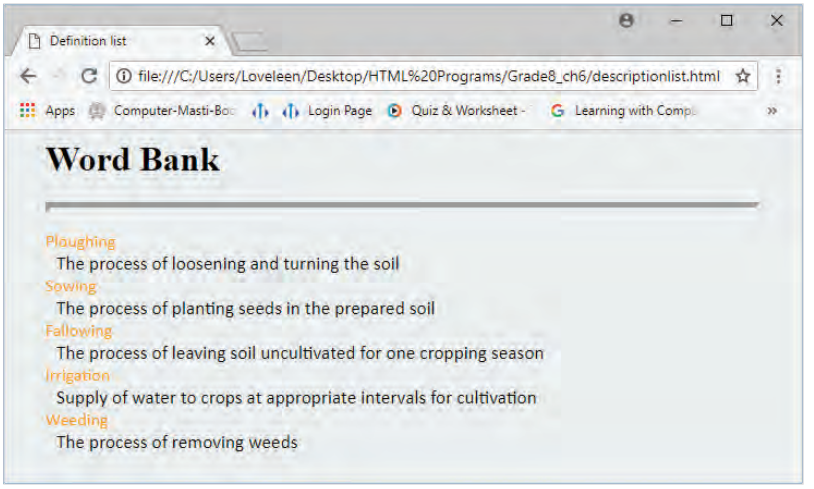


Fig. 6.6 Output of the previous program

After explaining different types of lists and their properties, Peter decides to test Satish and asks him to answer a few key questions as listed below.

Checkpoint

Answer the following questions.

1. Mention the properties associated with ordered and unordered lists.
2. Is it possible to create an ordered list under an unordered list? If yes, support your answer with the appropriate HTML code and test it.
3. Mention the tags used to create a definition list.

Tables in HTML

Satish is quite confident now as he has learnt a lot of new things in HTML.

'There is one more way to present your information in a systematic way,' tells Peter.

'What's that?' asks Satish.

'That is with the help of tables. Let me explain you how to create tables,' says Peter.

A table allows to exhibit data into rows and columns. It can contain text, images, or links. Each table may have a caption relevant to the information and data presented in the table that provides a brief description of the table.

Peter then lists the following tags used to create a table in HTML.

- **Table** `<table>` **tag—**Used to define a table
- **Table header** `<th>` **tag—**Used to define the heading of a column
- **Table row** `<tr>` **tag—**Used to define a table row
- **Table data** `<td>` **tag—**Used to define a table cell
- **Table caption** `<caption>` **tag—**Used to define a heading for the table

He further adds that table headings are bold and centre-aligned by default, while a table cell data is regular and left-aligned.

'Let me show you how to create a table,' says Peter. He then writes the following code and shows the output to Satish.

```
<html>
<head></head>
<title> Table-1</title>
<style type="text/css">
h1{font size: 20px; text-align: center; color: black}
p{font-family: times new roman; font-size: 12pt; text-align: justify;
margin-right: 20px}
body{background-color:#EAEDED}
```

```
</style>
<body>
<h1>Harmful Microorganisms</h1>
<p>Although microorganisms are extremely useful to human health and our ecosystems, they can invade the humans, animals, and plants to cause diseases. These disease-causing microorganisms are called germs or pathogens. The diseases caused by the germs are called communicable (infectious) diseases. These diseases can be passed from one person to another by the transfer of microorganisms through air, water, food, and direct or indirect physical contact. There are certain insects which act as carriers of disease-causing germs.</p>
<table>
<caption> Diseases caused by different microorganisms and their modes of transmission</caption>
<tr>
<th>Disease</th>
<th>Disease-causing germ</th>
<th>Mode of transmission</th>
</tr>
<tr>
<td>Tuberculosis</td>
<td>Bacteria</td>
<td>Inhaled droplets in the air</td>
</tr>
<tr>
<td>Typhoid</td>
<td>Bacteria</td>
<td>Water</td>
</tr>
<tr>
<td>Mumps</td>
<td>Virus</td>
<td>Air, direct or indirect</td>
</tr>
<tr>
<td>Common cold</td>
<td>Virus</td>
```

```
<td>Air</td>
</tr>
</table>
</body>
</html>
```

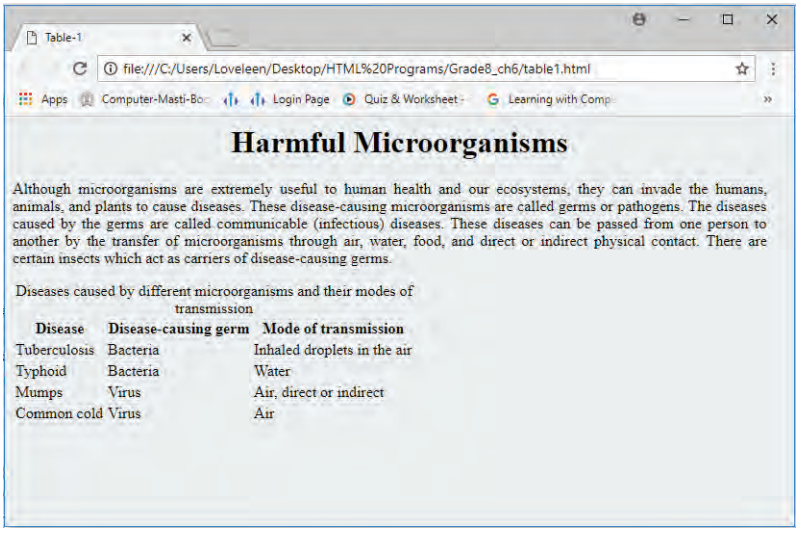


Fig. 6.7 Output of the previous program

Properties of Tables in HTML

Satish notices that there are no borders around the table, and even the cells are not defined properly.

'Why is that so? Why are there no borders and cells?' asks Satish.

'Let me describe you some of the table properties that will help you improve the structure of the table,' replies Satish.

- **Caption-side:** Lets you set the position of the caption

  Syntax: caption-side:value

  where value = top|bottom
- **Border:** Used to specify the border width, border style, and border colour of the table and its cells

  Syntax: border:value

  where value = border width value border style value border color value
- **Border-spacing:** Used to set the distance between the borders of the adjacent cells

  Syntax: border-spacing:value

  where value = horizontal spacing|vertical spacing

  The values can be in cm or pixels. If only one value is specified, then it depicts both the horizontal and the vertical spacing values.
- **Border-collapse:** Used to specify whether the table borders should be collapsed or not

  Syntax: border-collapse:value

  where value = separate|collapse

- **Height:** Used to specify the height of the table
  Syntax: height:value
  where value = length in cm|px
- **Width:** Used to specify the width of the table
  Syntax: width:value
  where value = length in cm|px
- **Empty cells:** Specifies whether to display borders and background for empty cells or not
  Syntax: empty-cells:value
  where value = show|hide

'These properties can also be used with the `<td>`, `<tr>` and `<th>` tags,' tells Peter.

Satish then modifies the previous program and shows its output to Peter.

```
<html>
<head></head>
<title> Table-2</title>
<style type="text/css">
h1{font size:20px; text-align: center; color:black}
p{font-family:times new roman; font-size:12pt; text-align:justify; margin-right:20px}
body{background-color:#EAEDED}
table{border:2px solid green; border-spacing:3px 3px; caption-side:bottom; border-collapse:collapse; width:60%; height:40%}
th,td,tr{border:2px solid green; border-collapse:collapse}
</style>
<body>
<h1>Harmful Microorganisms</h1>
<p>Although microorganisms are extremely useful to human health and our ecosystems, they can invade the humans, animals, and plants to cause diseases. These disease-causing microorganisms are called germs or pathogens. The diseases caused by the germs are called communicable (infectious) diseases. These diseases can be passed from one person to another by the transfer of microorganisms through air, water, food, and direct or indirect physical contact. There are certain insects which act as carriers of disease-causing germs.</p>
<table>
<caption> Table 1.1 Diseases caused by different microorganisms and their modes of transmission</caption>
<tr>
<th>Disease</th>
<th>Disease-causing germ</th>
```

```
<th>Mode of transmission</th>
</tr>
<tr>
<td>Tuberculosis</td>
<td>Bacteria</td>
<td>Inhaled droplets in the air</td>
</tr>
<tr>
<td>Typhoid</td>
<td>Bacteria</td>
<td>Water</td>
</tr>
<tr>
<td>Mumps</td>
<td>Virus</td>
<td>Air, direct or indirect</td>
</tr>
<tr>
<td>Common cold</td>
<td>Virus</td>
<td>Air</td>
</tr>
</table>
</body>
</html>
```

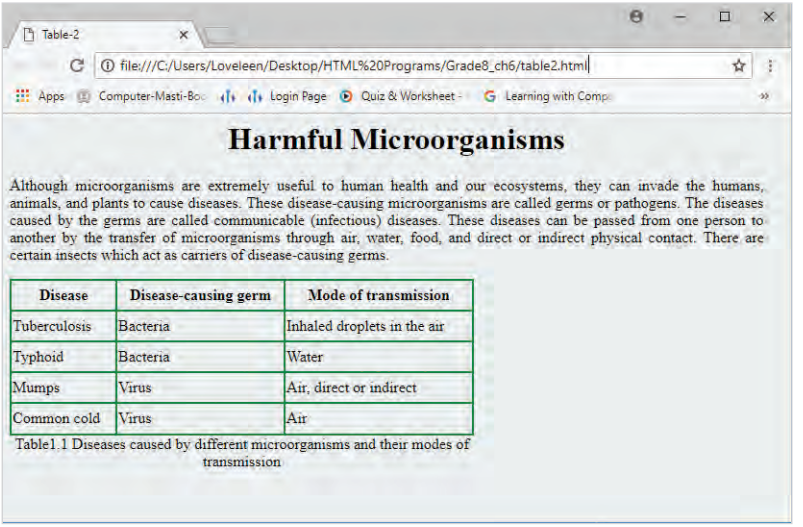


Fig 6.8 Output of the previous program

Properties of the <td> Tag

'There are some more tags that you can apply to the <td> tag. Let us discuss these tags,' says Peter to Satish.

Peter then lists out the following properties along with their syntaxes.

- **Text-align:** Used to set the horizontal alignment of text in a table

  Syntax: text-align:value

  where the value can be left, right, or center

- **Vertical-align:** Used to set the vertical alignment of text in a table

  Syntax: vertical-align:value

  where the value can be top, middle, or bottom

- **Padding:** Specifies the distance between the content in a cell and the border

  Syntax: padding:value

  where value = top padding|right padding|left padding|bottom padding

The values can be in cm, pixel, or percentage.

Satish then modifies his previous code again and shows the output to Satish.

```
<html>
<head></head>
<title> Table-3</title>
<style type="text/css">
h1{font size: 20px; text-align: center; color: black}
p{font-family: times new roman; font-size: 12pt; text-align: justify; margin-right: 20px}
body{background-color:#EAEDED}
table{border:2px solid green; border-spacing:3px 3px; caption-side:bottom; border-collapse:collapse; width:60%; height:40%}
th, tr{border:2px solid green; border-collapse:collapse}
td{border:2px solid green; border-collapse:collapse; padding:10px; vertical-align:middle; horizontal-align:left}
</style>
<body>
<h1>Harmful Microorganisms</h1>
<p>Although microorganisms are extremely useful to human health and our ecosystems, they can invade the humans, animals, and plants to
```

cause diseases. These disease-causing microorganisms are called germs or pathogens. The diseases caused by the germs are called communicable (infectious) diseases. These diseases can be passed from one person to another by the transfer of microorganisms through air, water, food, and direct or indirect physical contact. There are certain insects which act as carriers of disease-causing germs.</p>

<table>

<caption> Table 1.1 Diseases caused by different microorganisms and their modes of transmission</caption>

<tr>

<th>Disease</th>

<th>Disease-causing germ</th>

<th>Mode of transmission</th>

</tr>

<tr>

<td>Tuberculosis</td>

<td>Bacteria</td>

<td>Inhaled droplets in the air</td>

</tr>

<tr>

<td>Typhoid</td>

<td>Bacteria</td>

<td>Water</td>

</tr>

<tr>

<td>Mumps</td>

<td>Virus</td>

<td>Air, direct or indirect</td>

</tr>

<tr>

<td>Common cold</td>

<td>Virus</td>

<td>Air</td>

```
</tr>
</table>
</body>
</html>
```

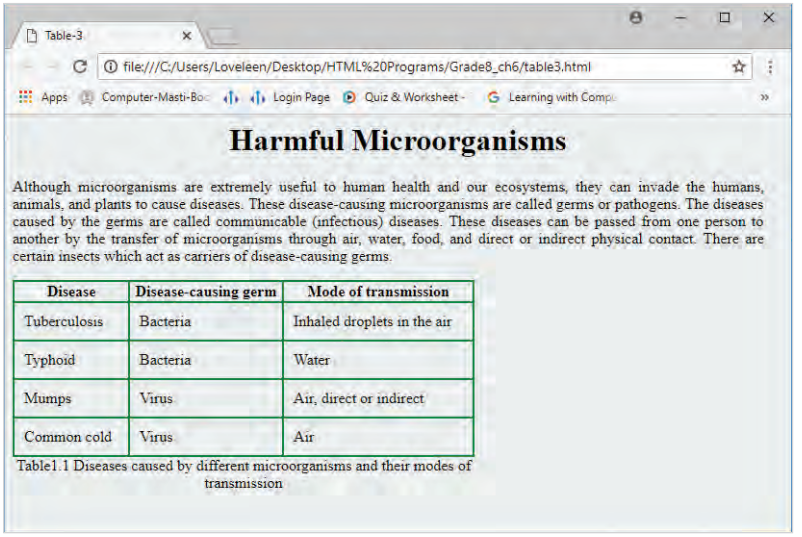


Fig 6.9 Output of the previous program

Key Terms

Unordered list	A list in which the orders of items is not fixed
Ordered list	A numbered list of items with a definite order
Nested list	A list within a list
Description list	A list of items where each list item has a definition
Table	A representation of information/data in column and row format
Cell	A unit formed by the intersection of a row and a column in a table
Cell Spacing	The space between cells of a table
Cell padding	The space between the content of a cell and the cell borders

Recap

- HTML lists are used to present the information in a systematic way.
- An ordered list is a numbered list created using the `<ol>... </ol>` tags.
- A bulleted list of items gives us an unordered list created using the `<ul>` and `</ul>` tags.
- A list can be inserted in another type of list. This is known as nesting of lists.
- HTML description list is also known as a definition list. It is used to list definitions in the lists to ease it for the readers.
- A description list is created using the `<dl>`, `<dt>`, and `<dd>` tags.
- HTML tables are created using the `<table>` tag.
- The `<tr>` tag is used to define a row.
- The headings are defined using the `<th>` tag.
- The column is defined using the `<td>` tag.
- The `<caption>` tag is used to define the title of the table.

Exercise

A. Choose the correct options.

1. Which of the following properties is used to set an image as the list-item marker?

   a) List-style-image b) List-style-picture c) List-type-image d) List-image

2. Which of the following properties is used to set the distance between the borders of the adjacent cells?

   a) Border-height b) Border-width c) Border-spacing d) Border-collapse

3. Which of the following properties is used to set the position of the caption in a table?

   a) Caption-position b) Caption-side c) Caption-placement d) Caption

4. Which of the following tags describes the description list?

   a) `<dl>` b) `<dt>` c) `<dd>` d) `<ol>`

5. What will be the output of the statement `<ol start=5>`?

   a) The list will begin from 5 and increase by increments of 1.

   b) The list will begin from 1 and end at 5.

   c) The list will begin from 1 and increase by increments of 5.

   d) The list will begin from 5 and increase by increments of 5.

B. Fill in the blanks.

1. The _____ property specifies the distance between the content in a cell and its border.
2. The _____ tag describes the data term.
3. An ordered list begins with the _____ tag and ends with the _____ tag.
4. The_____ tag is used to define each term in the list.
5. Each table row is interpreted with a _____ tag.

C. State *true* or *false*.

1. An unordered list can also be represented by images as list-item markers.
2. The 'start' attribute is used to specify the numbering for the list items in descending order.
3. A description list is also known as a definition list.
4. By default, table headings are bold and centre-aligned.
5. The text-align property is used to set the horizontal alignment of the text.

D. Answer the following questions.

1. What is the difference between `<ol>` and `<ul>` tags?
2. What are the possible values of the list-style-type property?
3. Describe the attributes associated with the ordered list.
4. How table rows are defined and data is entered in HTML?
5. Define the use of the following table properties.

   a) Caption b) Border c) Border-collapse d) Height

Application-based Questions

1. Observe the HTML code given below and answer the following questions.

```
<style type="text/css">
<H1> Properties of Square Numbers </H1>
<ol>
<li>A natural number that has 2, 3, 7, or 8 at the ones place is
never a perfect square.</li>
<li>A natural number having 0, 1, 4, 5, 6, or 9 at the ones place may
or may not be a perfect square.</li>
<li>The square of an odd number is always odd. </li>
<li>The square of an even number is always even.</li>
</ol>
```

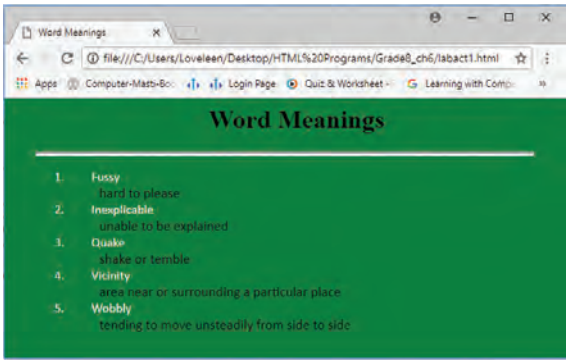
   a) What type of list will be created?
   b) What is the default list-item marker style?
   c) Change the above code to begin the list from 'A'.

2. Find the error(s) in the following code and write the correct code.

```
<style type="text/css">
td{border:2px solid green; caption:bottom; bordercollapse; width:60%;
height:40%}
th, tr{border:2px solid green; border-collapse:collapse}
</style>
```

Lab Activity

1. Nazia has created a web page as shown below. She has listed meanings of some of the difficult words in an alphabetical order. Write the HTML code for the web page.



2. It is the tenth annual day celebration programme in Asmita's school. She has to write about the events that are to be performed in the programme. Also, she has to mention the venue and time for the events in a table. Help her create a web page to show the information.

Project

1. Collect information about some historical monuments in Delhi. Create a table showing the name, year of commissioning, location, and material used to build the monument. Write the HTML program and display the data on a web browser.
2. Collect data for two countries on the basis of health, education, GDP, and population.
3. Present the appropriate information and show a comparison (in a table) between the two countries. Write an HTML program to display your information.

Explore More

Find out and learn about some more properties associated with the lists and tables.

Work Wisely

- Always close the container elements.
- Never indulge in copying content from other websites. It is illegal and not a good practice.

Weblinks

- https://www.w3schools.com/html/html_lists.asp
- https://www.w3schools.com/html/html_tables.asp
- https://computerservices.temple.edu/creating-tables-html

Notes for the Teacher

- Explain the importance of lists and tables.
- Demonstrate how to create lists and tables.

7 Inserting Objects in HTML

After going through this chapter, you will be able to—

- **insert** images in HTML;
- **learn** about linking web pages; and
- **learn** about inserting audio and video files to a web page.

In the previous chapter, Satish has just learned about HTML, and how it can be used to create a website. He learnt that Hypertext Markup Language (HTML) lists are used to present data in a systematic way. He also learnt about creating nesting lists, description lists, and tables to exhibit data.

Equipped with his new knowledge, he creates many web pages for his e-learning website along with his friend, Peter. They both are happy with the web pages they have created so far. Now the need for adding images to enhance the appearance and design of the web pages arises. Satish wants to support the e-learning material with pictures. He needs help to perform this task. He decides to ask Peter for help.

Inserting Images in HTML

Satish is curious to know more about HTML. Peter tells Satish that web browsers support various types of graphics formats, such as JPEG (Joint Photographic Experts Group), PNG (Portable Network Graphics), GIF (Graphics Interchange Format), and TIFF (Tagged Image File Format). He further explains that the `<img>` tag is used to define images. It does not have a closing tag and thus, it is an empty tag. There are some attributes associated with this tag.

'Let us discuss these tags,' says Peter.

He then lists out the attributes as follows:

- **src:** Specifies the location (URL) of the image

  Syntax: `<img src="URL">`

  where URL is the path of the image.

- **height:** Specifies the height of the image

Syntax: `<img src="URL" height:value>`

where value is in pixels.

- **width:** Specifies the width of the image

  Syntax: `<img src="URL" width:value>`

  where value is in pixels.

- **alt:** Specifies alternate text for an image

  Syntax: `<img src="URL" alt="text">`

The 'alt' attribute is useful when the image is not displayed on the browser due to some reasons (may be because of the incorrect URL of the image or slow internet connection). The 'text' value is then displayed in place of the image. You can provide some useful description of the image.

Did You Know?

You can add an image to a background of the window by using the property given below.

```
body{background-image:
"url"}
```

Here 'url' is the location of the image.

Now it is Satish's turn to add images to a web page. He opens one of his previously created files and modifies the program as follows:

```
<html>
<head></head>
<title> Agricultiral Practices (images)</title>
<style type="text/css">
body{background-color:#EAEDED}
h1{font size:20px; text-align:center; color:green; margin:30px}
p{font-family:times new roman; font-size:13pt; text-align:justify; margin-
left:20px; margin-right:20px}
hr{margin-left:30px; margin-right:30px; border-width:3px}
h3{font size:14pt; margin-left:30px}
ul{list-style-type:square}
li{margin:5px}
</style>
<body>
<h1> Agricultural Practices</h1>
<hr>
<p>Cultivation of crops is not a single-step process. To cultivate crops,
the farmers are required to perform several tasks or activities. These
activities are spread over a period of time and are known as agricultural
practices. These practices include: </p>
<ol>
```

```
<li>Preparation of soil</li>
```

The very first step in growing a crop is soil preparation. Soil preparation refers to the processing of soil before sowing the seeds. It includes turning the soil, loosening it, and breaking large lumps into fine soil. The process of loosening and turning the soil is called tilling or ploughing.

Various tools or implements are used in the preparation of soil. These are:

```
<ul>
<li>Plough</li>
```

A plough is an important tool used in tilling the land. The plough consists of a triangular iron blade called ploughshare that cuts through the soil. The blade is curved and helps to turn over the soil.

```
<img src="C:\Users\Loveleen\Desktop\HTML Programs\Grade8_ch7\plough.jpg" height=200 width=300 alt="Plough">
<li>Cultivator</li>
<li>Hoe</li>
<li>Leveller</li>
</ul>
<li>Sowing</li>
<li>Improving soil fertility</li>
<li>Irrigation</li>
<li>Protection from weeds</li>
<li>Harvesting</li>
<li>Storage</li>
</ol>
</body>
</html>
```

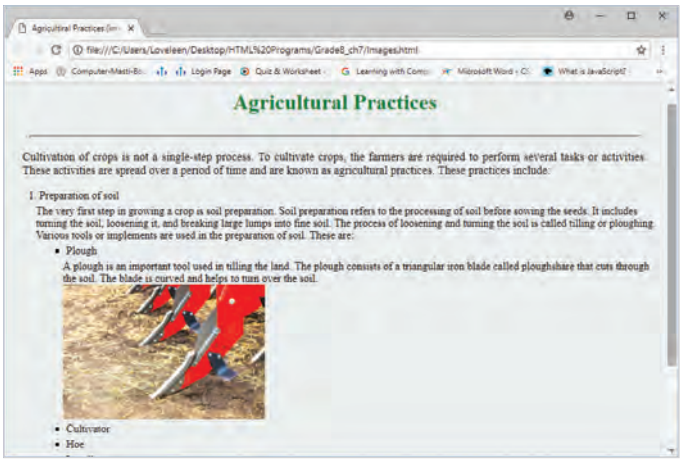


Fig. 7.1 Adding image to a web page

Linking Web Pages

'You have done a great job, Satish,' says Peter.

'Now let us move to the next important topic— creating hyperlinks,' Peter adds further.

'I know what a hyperlink is,' says Satish. This is how he defines the hyperlink:

A **hyperlink**, or just a **link**, can be an image or text in a document that takes you to a new file or an object.

Quick Tip

You can align an image using the float property. The syntax of the property is as follows:

```
<img src="url" style=float:value>
```

where the value can be left, right, top, or bottom.

‘Similarly, in HTML, a hyperlink can take you to another web page or a different section of the same page. The WWW (World Wide Web) is the linking of trillions of pages and files to one another through hyperlinks,’ adds Satish.

Peter further explains that there are three kinds of links:

- **Local**—a link to another page on the same website
- **Internal**—a link to a section on the current page
- **Global**—a link to a page on another website

Anchor Tag

Peter continues to explain to Satish that in HTML, the anchor `<a>` tag is used to create a link. It is a container tag. Anything between the start tag `<a>` and the end tag `</a>` gives a hyperlink. The href (Hypertext Reference) attribute is used along with the anchor `<a>` tag to specify the destination address of the document to which the link will take you.

The syntax of the anchor `<a>` tag is as follows:

```
<a href="URL">This is a link</a>
```

Peter then asks Satish to remember the following things:

- To create a local link, use the relative address of the web page, that is, without ‘http://www...’.
- To create a global link, use the absolute address, that is, the complete address of the web page.

Did You Know?

You can also provide some extra information about an element by using the title attribute. The information is viewed as a tooltip text when the mouse moves over the link.

Target Attribute in HTML Links

Peter now explains the target attribute in HTML links. He tells Satish that the target attribute defines the destination of the link. He lists out the possible values of the attribute as follows:

- **_blank**—opens the linked document in a new window or tab
- **_self**—opens the linked document in the same window or tab
- **_top**—opens the linked document in the full body of the window
- **_parent**—opens the linked document in the parent frame

Peter tells one more interesting thing about links in HTML. He states that by default, the links are indicated by different types of colours in all the web browsers. These are as follows:

- An active link is **red and underlined.**
- A visited link is **purple and underlined.**
- An unvisited link is **blue and underlined.**

CSS and Links

Now Peter tells Satish that the colour of the link can be specified based on the action performed using CSS. There are four link states as described below:

- `a:link`—a simple, unvisited link
- `a:visited`—a link that has been visited
- `a:hover`—a link where the user moves the mouse pointer over it
- `a:active`—a link that is active

Peter writes a code snippet to help Satish understand how to apply colours to links.

```
<style type="text/css">
a:link{color:blue}
a:visited{color:green}
a:hover{color:orange}
a:active{color:yellow}
</style>
```

Peter asks Satish to make note of the following points:

- `a:active` must come after `a:hover`
- `a:hover` must come after `a:link` and `a:visited`

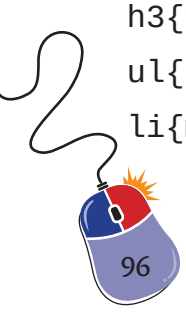
'Is it possible to change the font and font size of the hyperlinked text?' asks Satish.

'Yes, you can use text properties to do so,' replies Peter.

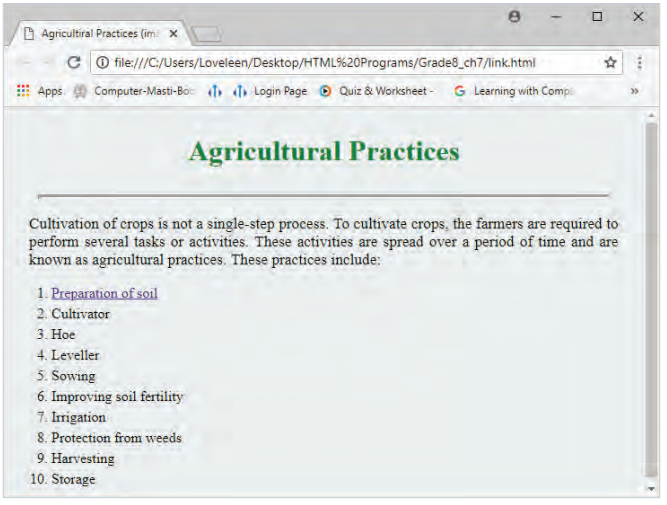
'Here is my program, have a look at it,' says Satish.

link.html

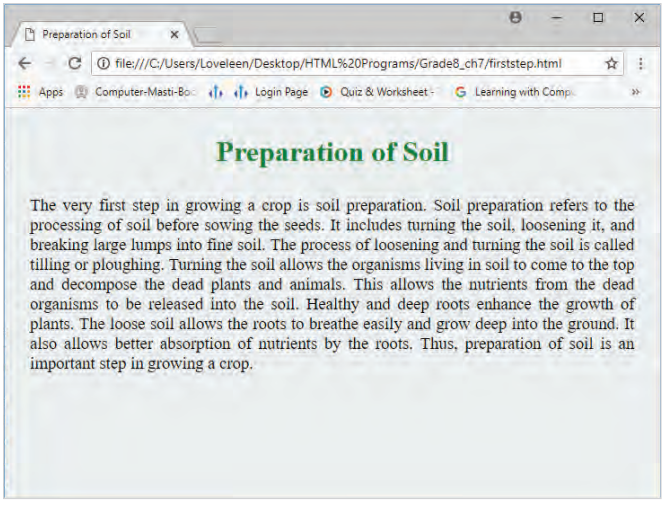
```
<html>
<head></head>
<title> Agricultiral Practices (images)</title>
<style type="text/css">
body{background-color:#EAEDED}
h1{font size:20px; text-align:center; color:green; margin:30px}
p{font-family:times new roman; font-size:13pt; text-align:justify; margin-
left:20px; margin-right:20px}
hr{margin-left:30px; margin-right:30px; border-width:3px}
h3{font size:14pt; margin-left:30px}
ul{list-style-type:square}
li{margin:5px}
```



```
</style>
<body>
<h1> Agricultural Practices</h1>
<hr>
<p>Cultivation of crops is not a single-step process. To cultivate crops, the farmers are required to perform several tasks or activities. These activities are spread over a period of time and are known as agricultural practices. These practices include: </p>
<ol>
<li><a href="firststep.html"> Preparation of soil</a></li>
<li>Cultivator</li>
<li>Hoe</li>
<li>Leveller</li>
<li>Sowing</li>
<li>Improving soil fertility</li>
<li>Irrigation</li>
<li>Protection from weeds</li>
<li>Harvesting</li>
<li>Storage</li>
</ol>
</body>
</html>
```



a) Creating a hyperlink



b) New document after clicking on the hyperlink

Fig. 7.2 Output of the previous program

Image Links

'You can also use an image as a link. When you click on the image, it will lead to another web page,' tells Peter.

'How can we do that?' asks Satish.

'You can use the `<img>` tag within `<a>...</a>` tags,' replies Peter.

He then writes the syntax as follows:

```
<a href="URL of the
destination web page"><img
src="URL of the image"></a>
```

Quick Learn

Create a table with the heading rows as shown below.

S.No.	Name of the monument	Image	Location

Fill in the rows with the data of your choice. Now make the images hyperlinks in such a way that when you click on the image, the information page of the monument should open.

Checkpoint

Answer the following questions.

1. Write the tags used to do the following:
   a) Insert an image b) Create a hyperlink
2. What is the use of the alt attribute?
3. What are the possible values of the target attribute?

Inserting Audio and Video

Satish has put in a lot of efforts to link his web pages together. Peter is also quite happy with his efforts.

'I can make your web pages look more interesting,' says Peter.

'What is next?' asks Satish.

'Do you know that you can also insert audio and video files into your web page?' says Peter.

'That's great! It would really help me. I can insert audio and video files related to a topic. This will make students learn the concepts better,' says Satish.

Inserting Audio

Peter explains to Satish that the `<audio>` tag is used to insert an audio file.

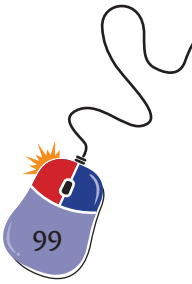
He lists out the attributes associated with the `<audio>` tag:

- **src**—specifies the URL of the audio file
- **autoplay**—plays the audio automatically when the web page is loaded

- **controls**—adds controls like play, pause, stop, forward, rewind, and volume
- **loop**—replays the audio again when it is finished

Peter then writes a code and shows to Satish how an audio file is inserted.

```
<html>
<head></head>
<title> Inserting Audio</title>
<style type=“text/css”>
body{background-color:#EAEDED}
h1{font size:20px; text-align:center; color:green; margin:30px}
p{font-family:times new roman; font-size:13pt; text-align:justify; margin-left:20px; margin-right:20px}
hr{margin-left:30px; margin-right:30px; border-width:3px}
h4{font size:14pt; margin-left:30px}
ul{list-style-type:square}
li{margin:5px}
</style>
<body>
<h1> Agricultural Practices</h1>
<hr>
<p>Cultivation of crops is not a single-step process. To cultivate crops, the farmers are required to perform several tasks or activities. These activities are spread over a period of time and are known as agricultural practices. These practices include: </p>
<ol>
<li>Preparation of soil</li>
<li>Sowing</li>
<li>Improving soil fertility</li>
<li>Irrigation</li>
<li>Protection from weeds</li>
<li>Harvesting</li>
<li>Storage</li>
</ol>
<h4> Click on the Play button to listen to the audio.</h4>
```



```
<audio src="C:\Users\Loveleen\Desktop\HTML Programs\Grade8_ch7\audio.
mp3" controls="controls" autoplay="autoplay">
</body>
</html>
```

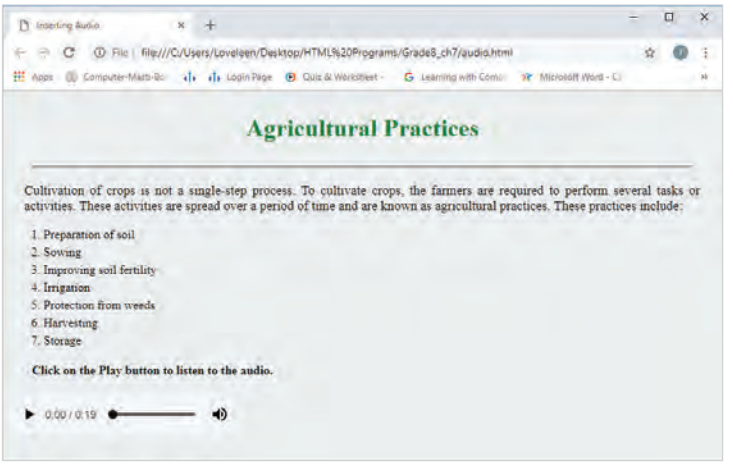


Fig. 7.3 Output of the given program (inserting audio into a web page)

Inserting Video

Peter now tells Satish that the `<video>` tag is used to insert a video into a web page.

'Note that the attributes **src, autoplay**, and **controls** of the `<audio>` tag are also valid for the `<video>` tag,' he further adds. He then lists out two more attributes associated with the `<video>` tag:

- **height**—specifies the height of the video player
- **width**—specifies the width of the video player

Satish writes a program code to insert a video into a web page.

```
<html>
<head></head>
<title> Inserting Video</title>
<style type="text/css">
body{background-color:#EAEDED}
h1{text-align:center; color:green; margin:30px}
p{font-family:times new roman; font-size:13pt; text-align:justify;
margin-left:20px; margin-right:20px}
hr{margin-left:30px; margin-right:30px; border-width:3px}
li{margin:5px}
</style>
<body>
```

```
<h1> Agricultural Practices</h1>
<hr>
<p>Cultivation of crops is not a single-step process. To cultivate crops, the farmers are required to perform several tasks or activities. These activities are spread over a period of time and are known as agricultural practices. These practices include: </p>
<ol>
<li>Preparation of soil</li>
<li>Sowing</li>
<li>Improving soil fertility</li>
<li>Irrigation</li>
<li>Protection from weeds</li>
<li>Harvesting</li>
<li>Storage</li>
</ol>
<h4> Click on the Play button to watch the video.</h4>
<video src="C:\Users\Loveleen\Desktop\HTML Programs\Grade8_ch7\mov.mp4" controls="controls" autoplay="autoplay" height="200" width="400">
</body>
</html>
```

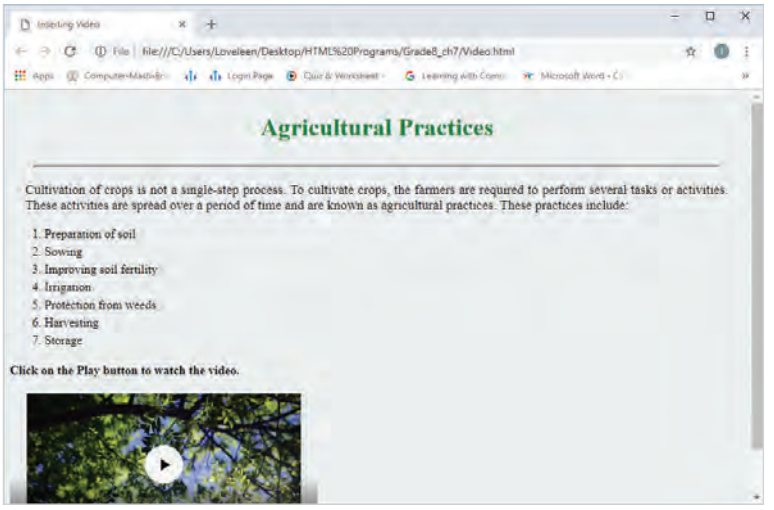


Fig. 7.4 Output of the given program (inserting video into a web page)

Frames in HTML

Peter now deals with the next topic. He tells Satish that a browser window can be divided into multiple sections where each section can hold a distinct HTML document. These individual sections are called frames. A collection of multiple frames in a browser window is called frameset.

He further adds that the `<iframe>` tag is used to define an inline frame in a web page. He then describes the attributes associated with the tag:

- **src—**defines the URL of the web page to be displayed in the frame
- **width—**specifies the width of the frame
- **height—**specifies the height of the frame
- **seamless—**shows the frame as a part of the containing element

Peter makes it clearer for Satish with the help of a program code.

```
<html>
<head></head>
<title> Iframes</title>
<style type="text/css">
body{background-color:#EAEDED}
h1{font size:20px; text-align: center; color:black; margin:30px}
p{font-family:times new roman; font-size:14pt; text-align:justify; margin-left:20px; margin-right:20px}
hr{margin-left:30px; margin-right:30px; border-width:3px}
h3{font size:14pt; margin-left:30px}
</style>
<body>
<h1> Metals and Non-Metals</h1>
<iframe  src="C:\Users\Loveleen\Desktop\HTML  Programs\Grade8_ch7\metals.html" height="400" width="400"></iframe>
<iframe src="C:\Users\Loveleen\Desktop\HTML Programs\Grade8_ch7\nonmetals.html" height="400" width="400"></iframe>
</body>
</html>
```

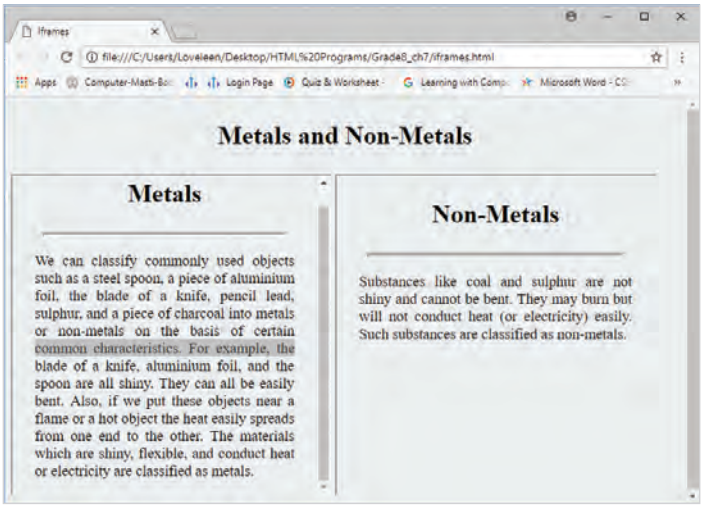


Fig. 7.5 Output of the given program (adding frames)

Key Terms

Local link	A link with a relative URL
Frame	Sections in the browser window where each section can show a distinct HTML document
Frameset	A collection of multiple frames in a browser window

Recap

- An inline image is inserted using the `<img>` tag.
- A hyperlink is created using the `<a>` tag. This tag is known as an anchor tag.
- The `<audio>` and `<video>` tags are used to insert audio and video files respectively into a web page.
- Frames enable us to open more than one windows in a single browser's window.
- The `<iframe>` tag is used to define an inline frame in an HTML document.

Exercise

A. Choose the correct options.

1. If a browser cannot find an image, which attribute value will it show in place of the image?

   a) src b) id c) href d) alt

2. What is the default colour of an unvisited link?

   a) Red b) Green c) Blue d) Purple

3. Which target attribute opens the linked document in a new tab or window?

   a) parent b) blank c) self d) top

4. Which of the following tags is used to insert an image?

   a) `<a>` b) `<img>` c) `<image>` d) `<anchor>`

5. Which of the following attributes specifies the URL of an audio file in a web page?

   a) href b) url c) address d) src

B. State *true* or *false*.

1. An image can be used as a link in a web page.
2. The `<img>` tag is a container tag.
3. An active link is red and underlined.
4. The loop attribute automatically plays the audio when a web page is loaded.
5. The `<movie>` tag is used to insert a video in a web page.

C. Fill in the blanks.

1. The_____ attribute of the `<video>` tag shows controls on the video player.
2. The mandatory attribute of the `<a>` tag is _____.
3. The _____tag enables us to display multiple documents in a single window.
4. The _____attribute of the `<a>` tag opens the linked document in the same window.
5. The _____attribute shows the frame as a part of the container element.

D. Answer the following questions.

1. Write the attributes associated with the `<audio>` tag.
2. Describe the different states of a link?
3. How will you add a video file to an HTML web page?
4. What is the difference between the `_self` and `_top` attributes?
5. What is the purpose of the height and width attributes of the `<video>` tag?

Application-based Questions

1. Rohan wanted to insert an image into a web page. He has written the following code. But the code has not produced the desired output. Help Rohan in correcting the code.

```
<body>
<H1> Inserting an image</H1>
<img href="image1.jpg" alt="Cherries">
</body>
```

2. Niharika wants to divide the browser's window into two parts. She wants to add an audio file, which has been recorded, in the first part and a video, which she has downloaded, in the second part. How can she do that? Help her in writing the code.

Lab Activity

1. Create a home page for your school's website. The web page should contain links to other web pages. Show images of your school on the web page.
2. Write an HTML program to display a table containing words in one column and their antonyms in the other column. You may refer to your English textbook.
3. Create a website containing multiple web pages. The web pages should display the following:
   - Product image
   - Product description and price

Project

1. Create a website on the topic 'Population' with two linked pages. The first web page should display information about 'Densely populated regions, moderately populated regions, and sparsely populated regions'. There should be a hyperlink 'Next' at the bottom of the page. On clicking 'Next', a new page should open showing information about 'Factors that affect population of a place'. Also, include appropriate and relevant images.
2. Mr Ranjan is a motivational speaker. He has recorded some of his speeches. He now wants his son, Abhinav, to create a web page containing details about him and his speeches (video). Help Abhinav in writing the program.

Work Wisely

Make sure that the source path of image, audio, or video files must be correct.

Explore More

Find out some more attributes and properties of `<img>`, `<audio>`, `<video>`, and `<a>` tags.

Weblinks

- https://www.w3schools.com/html/html_css.asp
- http://www.echoecho.com/htmllinks01.htm
- https://www.sitepoint.com/12-little-known-css-facts/

Notes for the Teacher

Instruct students about the basic rules and styles of writing a HTML code and tell them the advantages of doing so.

8 Strings and Functions in Python

After going through this chapter, you will be able to—

- **define** and **use** strings in Python and
- **create** and **use** functions.

Mehul studies in class 8 in Army Public School in Agra. He has got an assignment on Python. He is writing programs in Python. The assignment consists of ten programming tasks. He completes eight tasks easily, but gets stuck with two. He goes to his elder sister, Sanya, for help. Sanya studies in class 12, and computer science is her favourite subject.

Sanya helps Mehul in completing his assignment. She asks Mehul if he knows about loops and graphics in Python. Mehul answers that he learnt about these in his previous class.

Sanya tells Mehul, 'Do you want to learn more about Python?'

'Yes, why not?' replies Mehul.

'OK, today I will tell you about strings and functions in Python,' says Sanya.

Strings

Sanya starts with the first topic—strings. She tells Mehul that a **string** is a sequence of one or more characters (letters, numbers, and symbols).

Creating a String

A string can be created by enclosing characters within a pair of double quotation marks. She then shows Mehul an example to create a string.

```
>>>string1="Hello, Mehul!"
>>>print("string1")
```

Mehul quickly replies, 'This will show "Hello, Mehul!" as the output'.

Sanya replies in the affirmative.

Accessing Characters in Strings

'You can also access an individual element or a contiguous set of characters from a string,' tells Sanya. Here is what she explains:

'A substring is a part of a string. There are two operators used to extract a substring from a string. These are the index operator ([]) and the slice operator ([:]).'

Remember

Using float values in indexing will result in a TypeError.

The index operator is used to access an individual character in a string. The syntax of the index operator is as follows:

```
string[index]
```

Here, index is the integer value that denotes the index of the item you wish to access. The index of a string begins with 0. The index value –1 indicates the last item in the string, –2 refers to the second last item, and so on.

Sanya then writes the following example to help Mehul understand the concept.

```
>>>str1="My name is Mehul."
>>>print(str1[5])
```

The output of this code is as shown in Fig. 8.1.

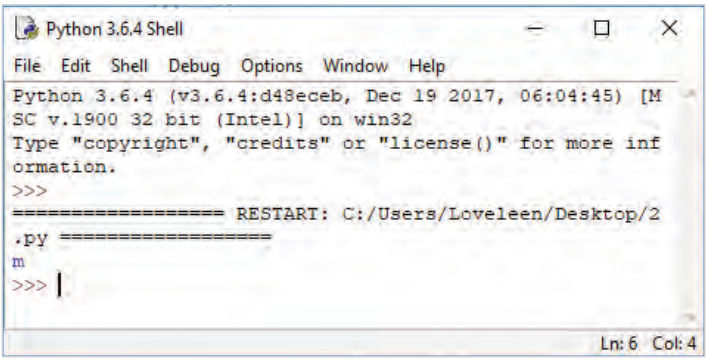


Fig. 8.1 Output of the previous program

Sanya further explains to Mehul that the slice operator returns the substring from the *n*th character to the *m*th character. This range includes the *n*th character but excludes the *m*th character. The syntax of the slice operator is as follows:

```
slice[n:m]
```

where both *n* and *m* are integer values.

She then writes the following program to explain the usage of the slice operator.

```
>>>name="My name is Mehul."
>>>print(name[2:5])
>>>print(name[1:4])
```

The output is shown in Fig. 8.2.

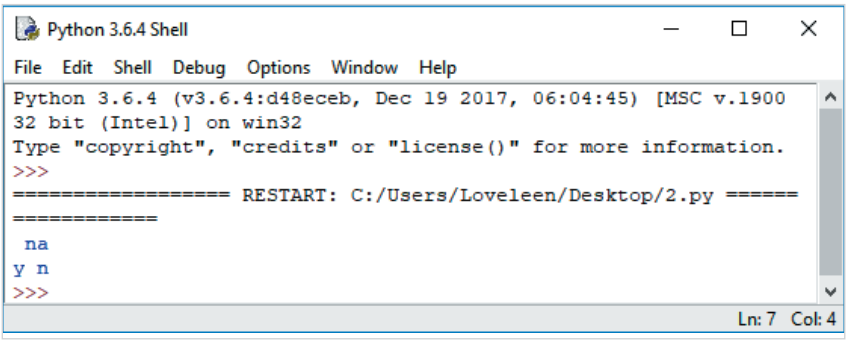


Fig. 8.2 Output of the previous program

Escape Characters

Sanya now explains that there are some certain situations where you may want to display the text in separate lines.

For this, Python provides escape sequences. An escape sequence is a non-printable character. It is written using a backslash (\) followed by the character.

Sanya gives an example to make Mehul understand the concept.

Suppose you want to display the message 'It is raining. Don't go outside.' on the screen in the following way:

```
It is raining.
Don't go outside.
```

In this case, you can write the statement as follows:

```
>>> print("It is raining.\nDon't go outside.")
```

The escape sequence \n, where 'n' is known as the new line character, displays the text following it in a new line. The output of the above statement will be displayed as shown in Fig. 8.3.

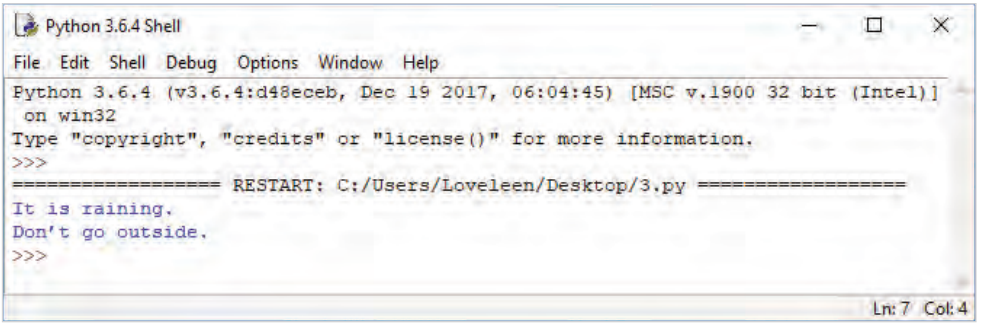


Fig. 8.3 Output of the previous program

She then lists down some of the other escape sequences in the table given below.

Escape Character	Description
\\	It is used to print a backslash.
\’	It is used to print an apostrophe.
\”	It is used to print double quotation marks.
\t	It is used to add a horizontal tab space between text.
\v	It is used to add a vertical tab space.

Python String Operations

Sanya tells Mehul that just like we perform operations with numbers, it is also possible to perform operations on strings. She then continues to explain to Mehul the string operations.

String Concatenation

String concatenation means adding or combining two strings. The plus (+) sign can be used to concatenate strings. Sanya explains it with this example:

```
str1=”It is raining.”
str2=”Don’t go outside.”
str3=str1+str2
print(str3)
```

After writing the above code, Sanya shows the output as shown in Fig. 8.4 to Mehul.

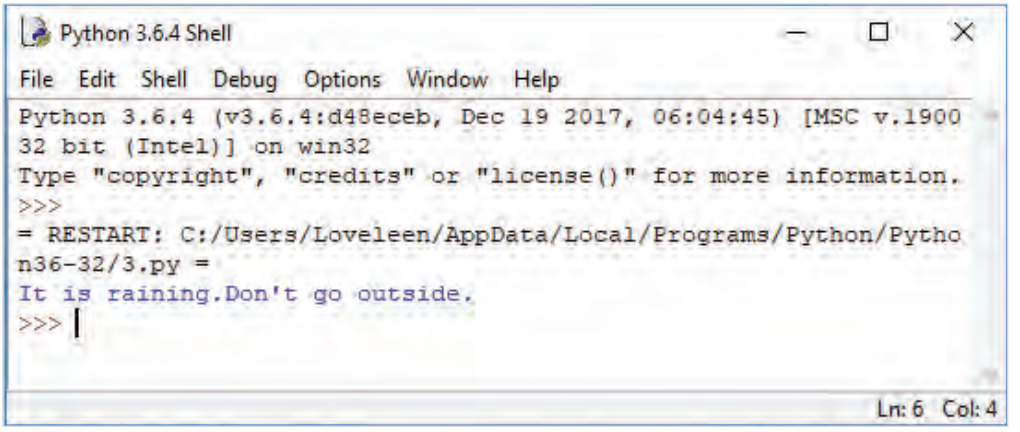


Fig. 8.4 Output of the previous program

Mehul notices that the plus operator simply combines the two strings. However, by default, there is no space between the two joined strings. Sanya tells him that Python has a way to deal with this problem. You can add a white space character between the two strings. She then modifies the previous code as follows:

```
str1=”It is raining.”
str2=”Don’t go outside.”
str3=str1+ “ ” + str2
print(str3)
```

Mehul runs the above code and gets the output as shown in Fig. 8.5.

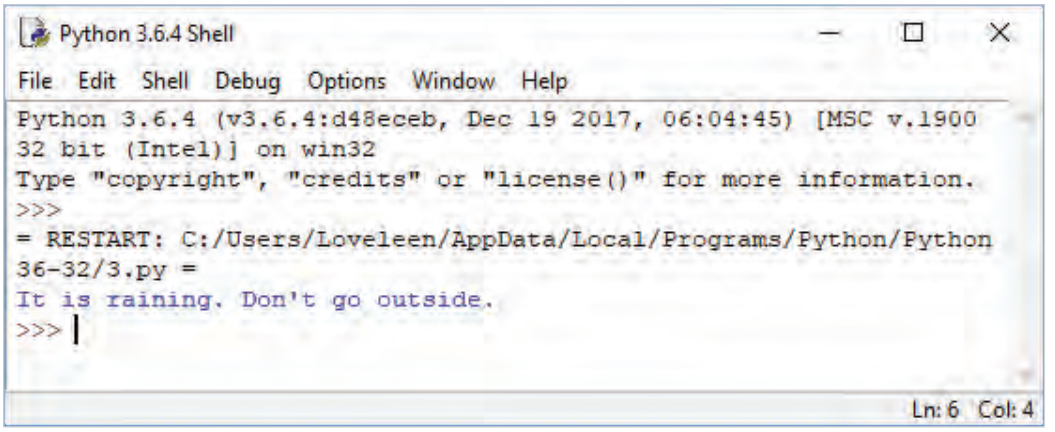


Fig. 8.5 Output of the previous program

Sanya then prepares a table depicting some more operators with their use as given below.

Operator	Use	Example
*	Repeats strings	"hi"*3 gives hihihi
in	Returns True if a substring exists within a string	'a' in "apple" gives True
not in	Returns True if a substring does not exist within a string	'b' not in 'apple' gives True

Checkpoint

Choose the correct options.

1. Which of the following operators concatenates (joins) two strings?
   a) + b) * c) [] d) [:]
2. The code a[0:2] in a="hall" gives the result_____.
   a) hal b) ha c) all d) al
3. Which of the following escape characters is for the new line?
   a) \n b) \a c) \d d) \i
4. Which of the following is an index operator?
   a) + b) * c) () d) []
5. Which of the following operators returns 'True' if a substring does not exist within a string?
   a) in b) not in c) in and not d) None of these

Functions in Python

'If you remember the things that I just taught you about strings, you can enjoy a lot with Python,' says Sanya. She now suggests that they should move ahead with learning about functions in Python. Here is what she explains about functions:

It is entirely possible that a programmer may need to use a block of code many times in different parts of

the same program. In such a situation, it is time-consuming to repeatedly write the same code over and over again. Hence, the best way to deal with such a situation is to use a **function**.

A function is a group of related statements that perform a specific task. It makes the program more readable as it organizes statements. A function is given a name that makes it easy to use the function. Once a function is defined, the user will be able to perform the task by its name and not by the steps involved to accomplish it.

Quick Learn

Bheem wants to write a program in Python to calculate the length of 'Hello' and 'Hello World!'. How can he do that?

Creating a Function

A function is created using a 'def' statement (short for definition). Sanya then explains it with the help of an example—the formula to calculate the area of a rectangle.

```
def area (l, b):
    return l*b
```

Sanya explains that this function will calculate the area of a rectangle for the given values of the length and breadth.

Advantages of Functions

'There are two main advantages of using functions,' tells Sanya to Mehul.

- When you define a function, you can use it over and over again without rewriting the same code.
- It provides better readability to the program.

'You can create your own function with its own functionality. For example, if you want to add two numbers, you can create a sum() function and use it whenever you want to add numbers,' explains Sanya to Mehul. She then gives the following example to Mehul.

```
def sum(a, b):
    return a + b
```

Rules for Defining a Function

Sanya then lists out some rules and instructs Mehul to follow them to define a function.

1. A function definition always begins with the keyword 'def' followed by the function name and parentheses ( )—for example add() is a function whose function name is 'add'.
2. You can pass parameters/arguments within the parentheses which are used within the function. For example—`def add (a,b)` has two parameters 'a' and 'b'.

```
def add (a,b):
    c=a+b
    print c
```

3. The code block of a function always starts with a colon (:).

```
def add (a,b):
  c=a+b
  print c
  return
```

4. The statement ‘return’ is used to exit from the function.

Calling a Function

Sanya then shows how to call a function when needed.

‘Defining a function only creates a function and its structure. To actually use that function, you need to call it in a program,’ tells Sanya.

She then writes a complete program to help Mehul understand how to call a function in a program.

```
def printer(st):
    print(st)
st=“I’m in a function.”
printer(st)
```

Calling a function

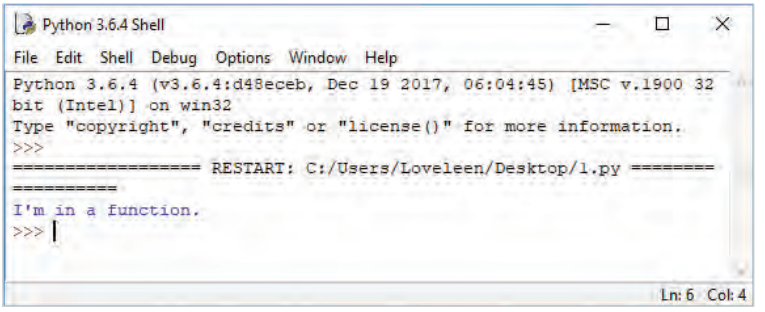


Fig. 8.6 Output of the previous program

Quick Tip

You can call a function from the Python prompt as well.

Remember

The return statement with no arguments is the same as return ‘None!’.

Return Statement

Sanya then explains to Mehul about one more statement—the return statement. She tells Mehul that it is used to exit from a function. It can optionally pass back any expression or calculated/stored result.

Sanya then makes it clearer for Mehul with the help of examples.

Example 1: To add two numbers

```
def add(a, b):
    sum=a + b
    return sum
a=20
b=30
sum=add(a, b)
print(sum)
```

Did You Know?

The len() function takes an empty space between two strings also into account.

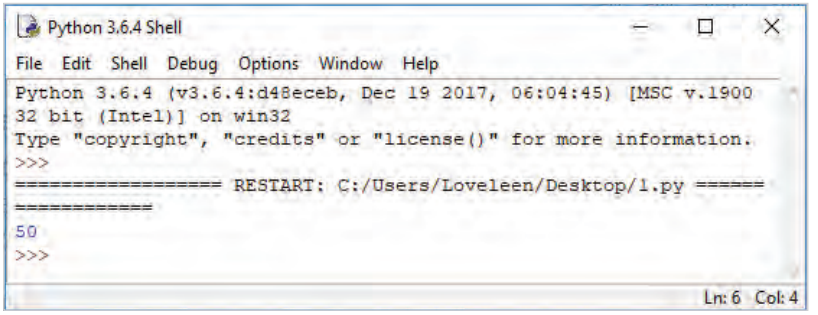


Fig. 8.7 Output of the previous program

Example 2: To find the square of a number

```
def square(a):
     result=(a*a)
     return result
result=square(14)
print(result)
```

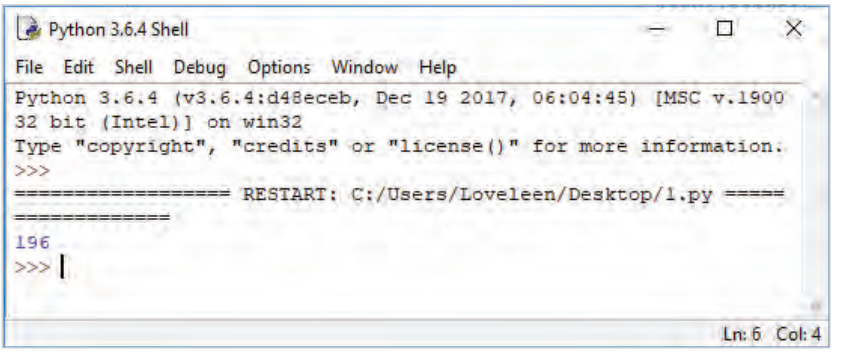


Fig. 8.8 Output of the previous program

Example 3: To check whether a number is prime or not

```
def check_prime(n):
    if (n==1):
        return False
    elif(n==2):
        return True
    else:
        for x in range(2, n):
            if (n%x)==0:
                return False
            return True
print(check_prime(20))
```

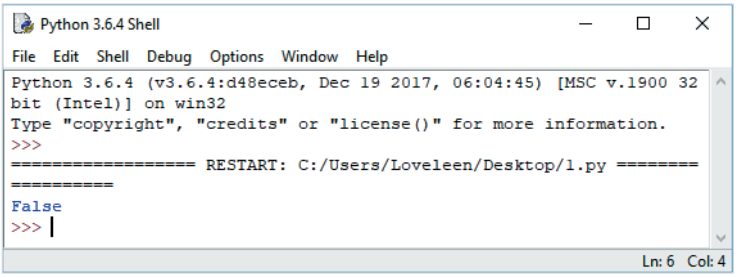


Fig. 8.9 Output of the previous program

Built-in String Methods

'There are some built-in string functions in Python, which can be directly used,' tells Sanya.

She then creates a table for Mehul and describes the purpose of each of the functions as given below.

Method	Description	Example
capitalize()	Capitalizes the first letter of a string	"hello".capitalize() >> Hello
isalpha()	Returns 'True' if the string has at least one character and all characters are letters of the alphabet	"hey".isalpha() >> True
isdigit()	Returns 'True' if string has at least one character and all characters are digits	"123".isdigit()>> True
islower()	Returns 'True' if string has at least one character and all characters are in lower case	"world".islower()>> True
isupper()	Returns 'True' if string has at least one character and all characters are in upper case	"HEY".isupper()>> True
len(string)	Gives the length of a string	len("hello") >> 5
upper()	Converts lower-case letters into upper case	"Hello".upper()>> HELLO

Sanya then writes an example showing the use of the string methods.

```
string1="I am learning functions in Python."
print(string1.upper())
print(len(string1))
print(isdigit())
```

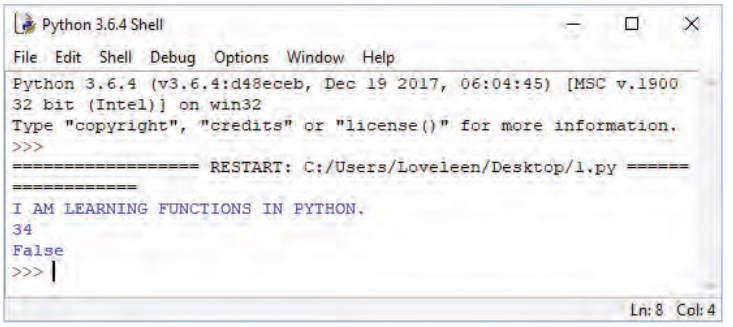


Fig. 8.10 Output of the previous program

Checkpoint

Answer the following questions.

1. Write the use of the following functions.
   a) isdigit() b) islower() c) upper()
2. Write some rules to create a function.

Key Terms

String	A sequence of one or more characters
Escape character	A non-printable character that is written using a backslash '\' and is followed by a character
Concatenation	Combining two or more strings
Function	A group of related statements that perform a specific task

Recap

- String is a data type in Python, which consist of a combination of characters.
- The index and slice operators are used to access the elements of a string.
- The plus '+' operator is used to concatenate the strings.
- Escape sequence characters are non-printable characters that are used to perform special functions.
- A function in Python is created using the keyword 'def'.
- To use a function after creating it, you must call it in a program.
- The return statement is used to exit from a function.

Exercise

A. Choose the correct options.

1. Which of the following operators is used to access a single character of a string?

   a) [ ] b) [:] c) {} d) {:}

2. Which of the following numbers marks the beginning of a string?

   a) 1 b) 0 c) 1 d) 2

3. Name the piece of code that can be reused to perform an action.

   a) Func b) Function c) Action d) Repeat

4. Which of the following symbols is used to denote an escape sequence character?

   a) * b) / c) \ d) #

5. Which keyword is used to define a function?

   a) def b) start c) begin d) define

B. State *true* or *false*.

1. A string contains characters within {}.
2. Global variables cannot be accessed outside a function.
3. The 'isupper()' function is used to convert lower-case letters to upper case in a string.
4. The * operator is used to repeat a function.
5. A function definition always begins with the keyword 'def' followed by the function name and parentheses.

C. Fill in the blanks.

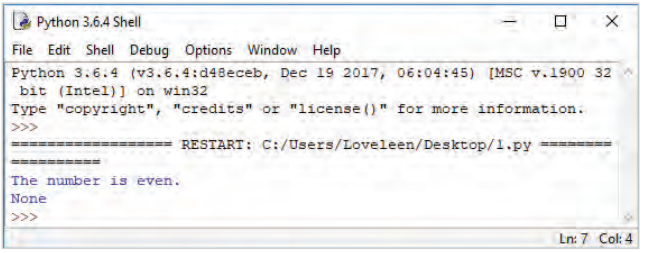
1. The _____statement is used to exit a function.
2. The _____function is used to find the length of a string.
3. The _____operator returns 'True' if a substring exists within a string.
4. A _____is a group of related statements that perform a specific task.
5. The _____function converts lower-case characters into uppercase.

D. Answer the following questions.

1. Describe escape sequence characters.
2. Define a function.
3. List any five built-in string methods with their uses.
4. What is the use of the return statement?
5. Write a function in Python to find the greater of the two numbers.

Application-based Questions

1. Mehul wrote the following program in Python to find if a number is even or odd. When he ran the program, he got the output as shown in the image given alongside.



What do you think has gone wrong in the program? Correct the program.

```
def eveodd(x):
 if x%2==0:
     print ("The number is even.")
else:
     print("The number is odd.")
print(eveodd(10))
```

2. Saloni has to write a program to calculate the length of her name and add 5 to it. After addition, she has to print the sum. How can she achieve this using Python?

3. What will be the output of the given program?

```
def func(message, times =1):
  print(message*times)
func("hello")
func("world", 5)
```

Lab Activity

1. Write a python program that takes your name as an input and gives the letters of your name as an output, each in a new line. For example, if the input is TIGER, the output should be as follows:

   T

   I

   G

   E

   R

2. Write a function in Python to find all the factors of a number.

Project

1. Write a function to convert the temperature from Fahrenheit to Celsius. Note down the temperature of any five cities in Fahrenheit and then try out the conversion.
2. Write a program to get a single string from two given strings, separated by a space and swap the first two characters of each string.

Work Wisely

- Always create a function if your piece of code for an action is long or is being repeated.
- Always use arguments passed in functions carefully because whatever change you make to them, gets reflected in the original variables.

Weblinks

- https://www.google.co.in/search?q=python&oq=python&aqs=chrome..69i57j69i6012j69i61j69i59.1215j0j1&sourceid=chrome&ie=UTF-8
- https://developers.google.com/edu/python/strings

Explore More

Find out some common built-in mathematical functions in Python.

Notes for the Teacher

- Help students learn about different built-in string methods.
- Make them visualize the importance of using functions.

9 Layers in Synfig

After going through this chapter, you will be able to—

- **work** with layers in Synfig;
- **add** the basic components of a computer network; and
- **use** the masking technique.

Murali is a student of Class 8. He is new in the school. One day, the computer science teacher, Mr Bipin Joshi, shows a fascinating trick in the class. He makes a sequence of many drawings in a small notepad and flips them quickly. The character in his drawings seems to come to life. The entire class is awestruck. He teaches them how he was able to do the trick.

Mr Joshi explains to the class that the trick was like an animation, which was the display of a sequence of images in order at a quick pace to create the illusion of movement. He continues, 'You can create the same type of animation using Synfig Studio. Today, we will learn more about Synfig Studio.'

Mr Joshi then explains that Synfig Studio, also known as Synfig, is an open-source 2D vector animation software. It was created by Robert Quanttlebaum with the help of Adrian Bently. It was released in the year 2005 under GPL (General Public License). It can be used to make a high-quality animation. It can be installed on Windows, macOS, and Linux operating systems.

'Let us begin our class with the topic—Layers,' says Mr Joshi.

Did You Know?

Synfig is free software and can be downloaded from www.synfig.org.

Layers

Mr Joshi then starts explaining the layers in Synfig and this is what he tells the class.

- Synfig breaks down individual elements of a canvas into layers.
- Every object and element has its own layer. In simple words, a single layer reflects or represents a particular object or an element. This allows a user to have a lot of flexibility and control over the animation.

Mr Joshi continues, 'You all might have learnt that each layer has a set of parameters, which determines how it behaves. This is done by selecting a layer from the Layers panel and then modifying it using the Params panel.'

Mr Joshi now takes the entire class to the computer laboratory and shows to them how to work with animations with multiple layers in Synfig.

Adding a Layer

Mr Joshi tells the class that when an object is created using any tool or added to the canvas, it appears as a layer, by default.

Grouping Layers

'We will now create a rectangle and add a gradient effect to it,' tells Mr Joshi.

This is how he demonstrates the steps to add a gradient effect to a rectangle.

1. He clicks on the **Rectangle** tool and drags the pointer over the canvas to draw the rectangle. He keeps the colour of the rectangle white to show the effect of the gradient.

Fig. 9.1 Creating a rectangle

2. Next, he clicks on the **Gradient** tool and selects the desired colour.
3. He drags the gradient over the rectangle. The entire canvas gets covered by the gradient.

Fig. 9.2 Gradient effect added to the entire canvas

Mr Joshi wants to add a gradient effect to the rectangle only. These are the steps he follows.

1. He selects both the layers by pressing the Ctrl key and right-clicks on them.
2. He then selects the **Group Layer** option. The layers are now grouped to a single layer.

3. He selects the gradient layer, goes to the Params panel, points over the **Blend Method** parameter, and changes the setting to **Onto**. By default, the setting is **Composite**.

The gradient gets applied to the layers below it.

Did You Know?

Synfig is written using C++.

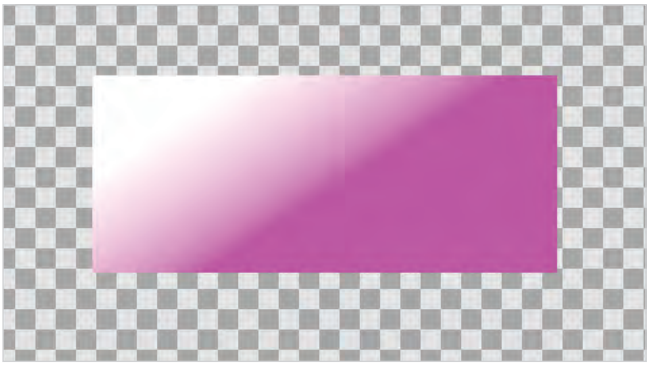


Fig. 9.3 Gradient effect added to the rectangle

Changing the Orders of Layers

Mr Joshi now begins explaining steps to change the order of layers.

1. He creates a circle using the **Circle** tool and places it on top of the rectangle drawn earlier on the canvas. Now, he tells the class that the circle layer is present above the rectangle layer.

   'This is because every time you create an object, it is created above the current layer,' he explains.

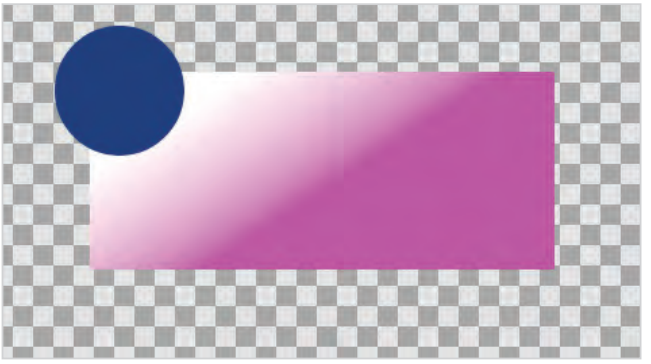


Fig. 9.4 Creating a circle

2. He selects the circle layer in the **Layers** panel and drags it below the **Group** layer.

   'This is how you change the order of a layer,' tells Mr Joshi.

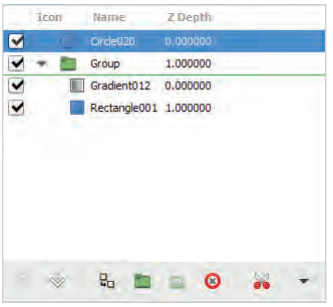


Fig. 9.5 Moving a layer

Quick Learn

Find out the ways to lock and hide a layer.

Renaming a Layer

To show how to rename a layer, Mr Joshi opens a new file and draws three circles of different colours using the **Circle** tool. He then follows these steps.

1. He right-clicks on one of the circle layers.
2. He then selects the **Set Layer Description** option from the context menu.

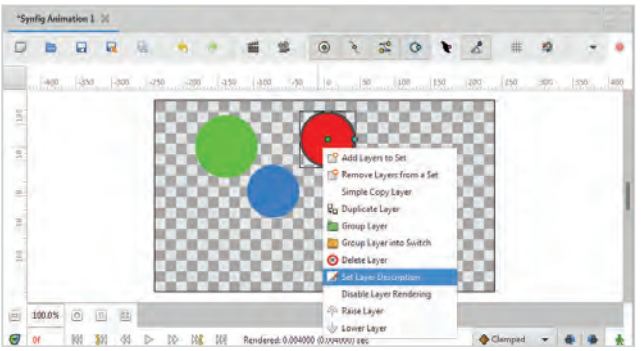


Fig. 9.6 Context menu

Quick Tip

To rename a layer, go to the Layers panel and double-click on the name of the layer that you wish to rename.

3. The **Set Layer Description** dialogue box appears. Mr Joshi writes the new name of the layer as 'CIRCLEONE' and then clicks on **Set**.

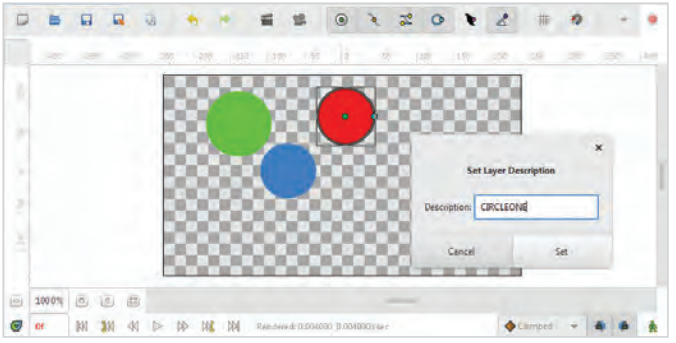


Fig. 9.7 Set Layer Description dialogue box

Quick Tip

To delete a layer, select the layer, and click on the cross symbol at the bottom of the Layers panel.

The children notice the new name in the layer box.

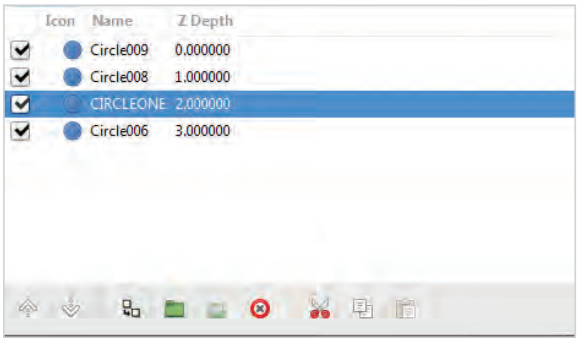


Fig. 9.8 Renaming a layer

Quick Tip

Use the Ctrl + I keyboard shortcut to import an image in Synfig.

Working with Pictures

Murali is excited and happy that he has learnt a new concept in Synfig. Mr Joshi now introduces the children to another interesting and useful topic—working with pictures in Synfig. He begins by explaining that it is also possible to insert images in Synfig.

Inserting a Picture

Mr Joshi demonstrates the steps to insert an image in Synfig.

1. He opens a new file and clicks on the **File** menu and selects the **Import** option.

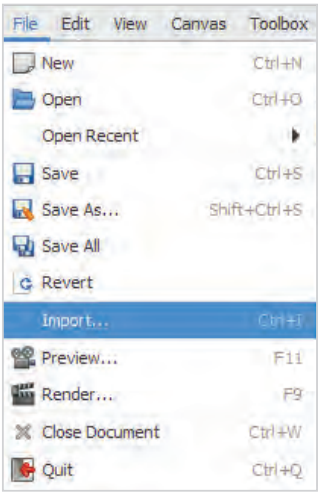


Fig. 9.9 Selecting the Import option

2. The **Please select a file** dialogue box opens. He locates the image he wants to insert, selects it, and clicks on the **Import** button.

The image gets inserted on the canvas.

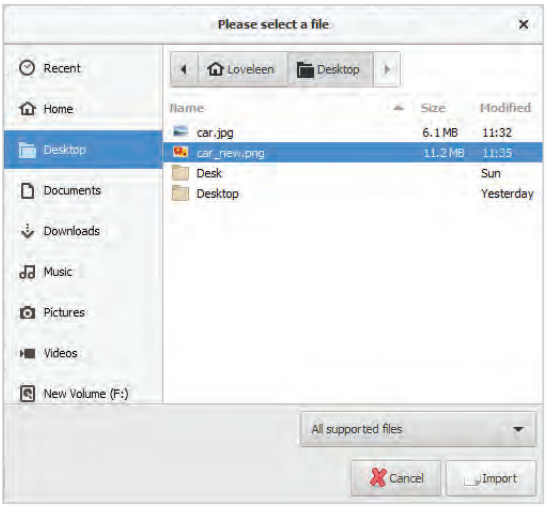


Fig. 9.10 'Please select a file' dialogue box

Moving an Object on a Specified Path

'Let me now teach you the steps to move an object on a specified path. The path can be created by using the Spline tool,' says Mr Joshi.

He then guides the children through these steps.

1. He selects the **Spline** tool from the toolbox.
2. He then selects only the **Create a outline layer** option, deselects all the other options in the **Spline Creation** box on the right side of the window, and creates a path on the canvas.
3. He now imports an image into the canvas.

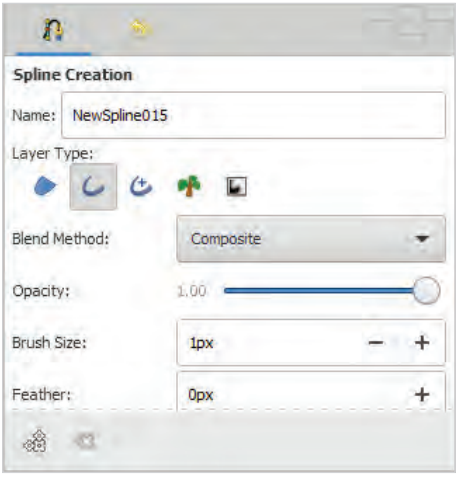


Fig. 9.11 'Please select a file' dialogue box

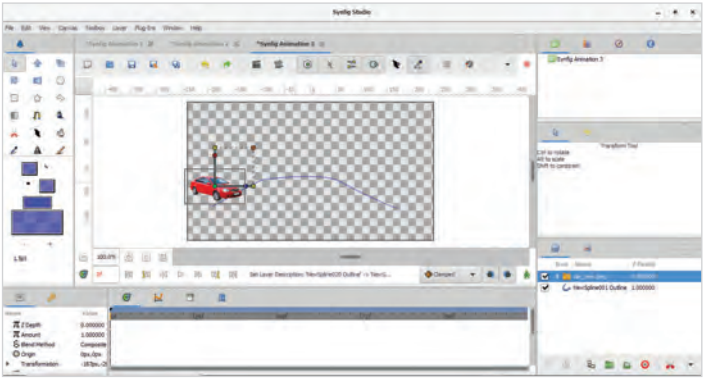


Fig. 9.12 Image appearing on the canvas

4. Next, he adds a new layer by right-clicking on the Layers panel and selecting **New Layer > Transform > Rotate option**. This adds a new rotate layer above the image layer.

'We have added a rotate layer above the image layer as we need to rotate the image,' Mr Joshi tells the class.

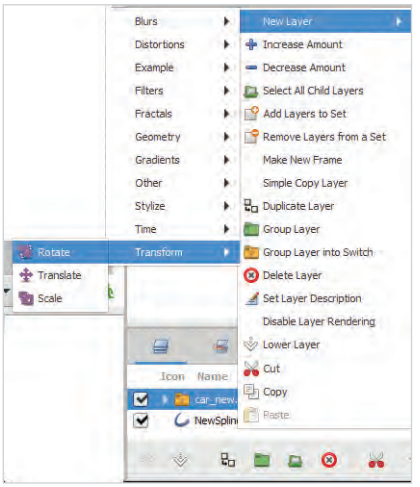


Fig. 9.13 Selecting the Rotate option

5. He now groups the rotate and the image layer together.

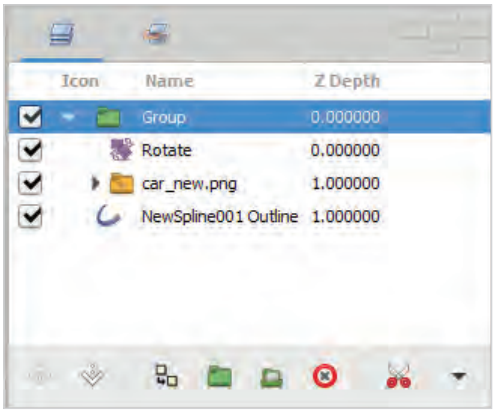
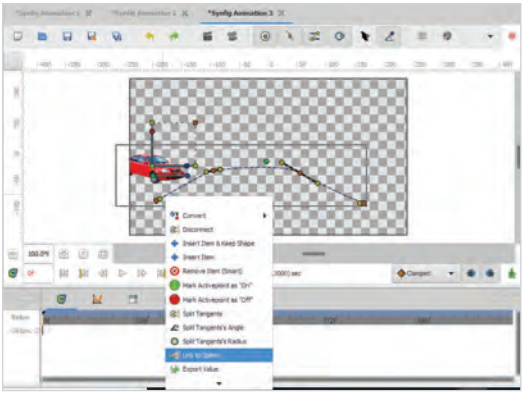
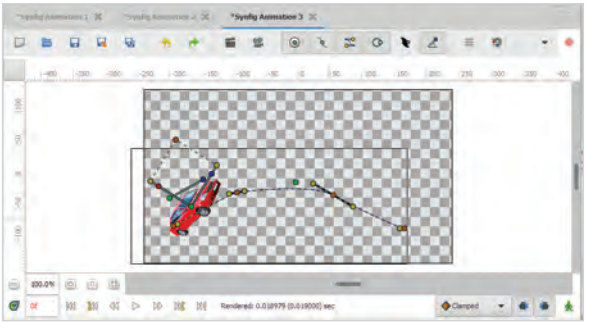


Fig. 9.14 Grouping the layers

6. Mr Joshi now selects both the rotate and image layers (by holding and pressing the Ctrl key) and brings the handles of both the layers near one another.
7. Keeping the Ctrl key pressed, he selects the blue duck of the rotation layer and then selects the spline layer.
8. He now right-clicks on the path on the canvas and selects the **Link to Spline** option. The image gets aligned with the path.



a)



b)

Fig. 9.15 Aligning the object on the path

9. He now turns on the animation editing mode, clicks on the '0f' mark, and drags the image to the starting point.
10. He continues to click on the marks on the timeline one by one, adds keyframes, and positions the image to show its movement.
11. Finally, he clicks on the **Preview** button to play the animation.

a) b)

Fig. 9.16 Previewing the animation

Checkpoint

Answer the following questions.

1. Write the steps to change the order of layers.
2. How will you add a gradient layer?
3. Write the steps to import an image.

Masking

'Now it's time to learn another fascinating feature in Synfig. It is masking. Can anyone tell me what masking is?' asks Mr Joshi.

One of the students describes masking as 'a feature that is used to hide or reveal areas of a layer'.

'That's correct!' says Mr Joshi.

'Let us now make the sun move from east to west and then hide it behind the tree,' he tells the class.

He demonstrates the following steps to the class.

1. He selects the **Rectangle** tool and creates a white background on the canvas.
2. Next, he imports an image of a tree that he had created in Tux Paint.
3. Then he selects the **Circle** tool and draws a circle on the top right corner of the canvas.

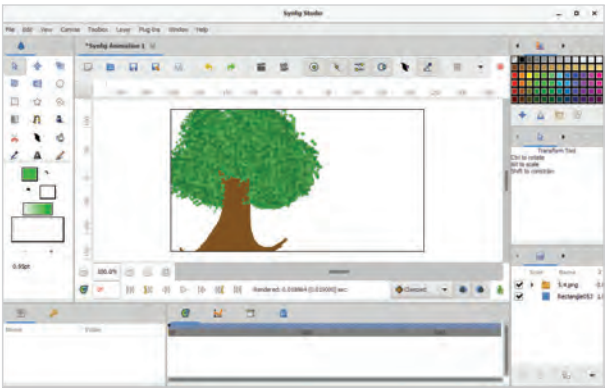


Fig. 9.17 Importing an image

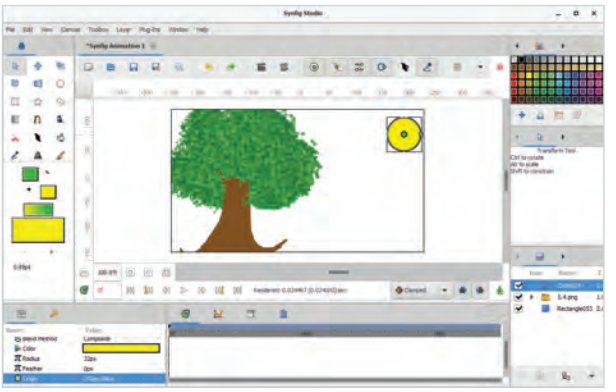


Fig. 9.18 Drawing a circle

4. He clicks on the **Turn on animate editing mode** button. A red border appears around the canvas.
5. After clicking on the '0f' mark, he adjusts the size of the circle and then clicks on the '96f' mark on the timeline.
6. He goes to the **Keyframes** panel and clicks on the button. The keyframe gets added to the panel.
7. Mr Joshi now drags and places the sun on the tree to show a motion in the sun. He also changes the colour of the sun (from yellow to orange).
8. He then clicks on the **Turn off animate editing mode**.

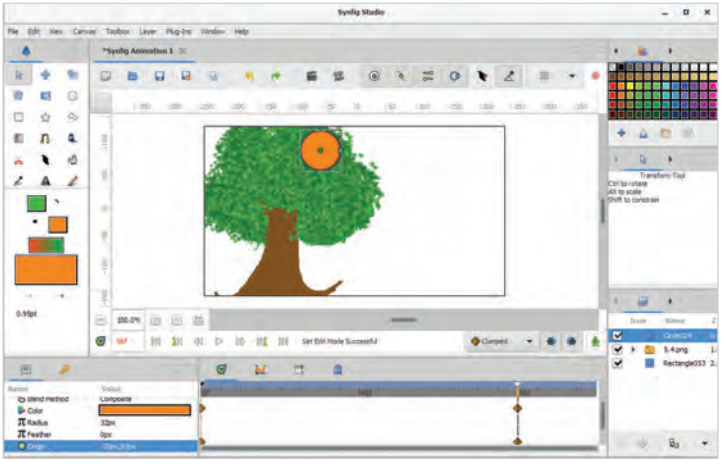


Fig. 9.19 Animating the circle

Mr Joshi now tells the class that the sun comes over the tree, but it should appear as if it is hiding behind the tree. He tells the class that this is where masking is applied. He then guides the students through the following steps.

9. He selects the **Spline** tool and draws a shape to hide the sun.

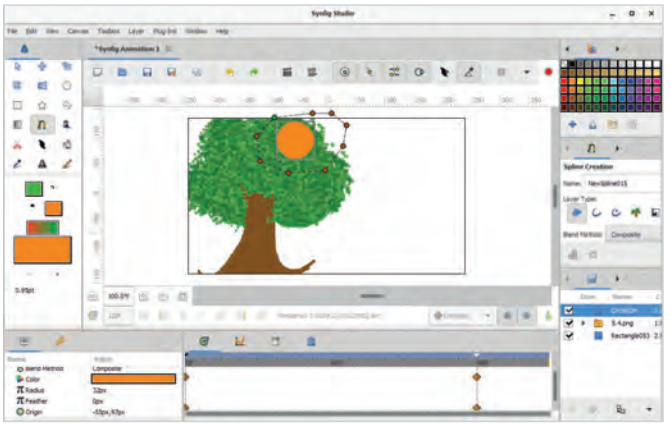


Fig. 9.20 Adding the spline layer

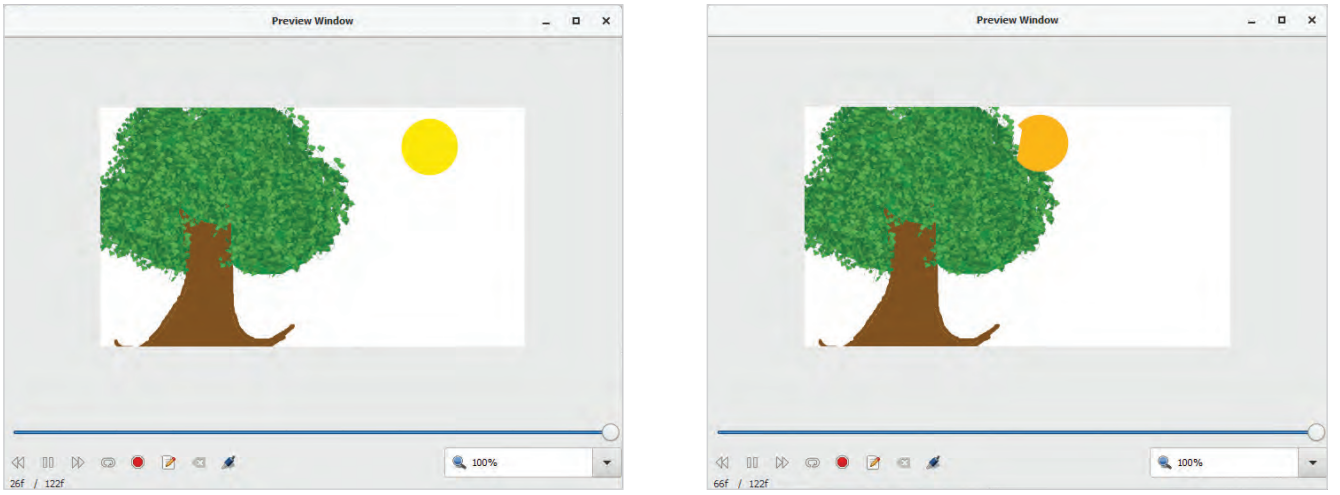
Remember

Only the layers that are below the mask layer are visible.

He asks the children to remember that the spline layer must be above the circle (sun) layer and these layers must be grouped together.

10. After grouping the layers, he selects the spline layer and goes to the Params panel.
11. On the **Blend Method** option, he selects the **Alpha Over** option.

Mr Joshi now plays the animation and shows it to the children.



a) b)

Fig. 9.21 Previewing the animation

Key Terms

Layer	A component in Synfig that represents a single object
GPL (General Public License)	A free software license that enables users to run, share, and modify the software
Masking	A feature that is used to hide or reveal areas of a layer

Recap

- Synfig Studio, also known as Synfig, is open-source 2D vector animation software developed in the year 2005.
- It can be used to make a high-quality animation (movie-like quality).
- Synfig breaks down individual elements of a canvas into layers.
- We can change the order in which the layers are placed to change the appearance of the animation.
- We can also set certain parameters for different layers.

Exercise

A. Choose the correct options.

1. Who is the developer of Synfig?

   a) Robert Quattlebaum b) Robert grazia c) Ann Maslow d) Henry Kauffman

2. Which of the following is the correct way to insert an image in Synfig?

   a) File > Import b) Ctrl + I c) Both a) and b) d) None of these

3. Which of the following tools will you use to mask an object?

   a) Move tool b) Transform tool c) Spline tool d) Line tool

4. Which of the following blend methods is used to mask an object?

   a) Straight b) Alpha On c) Straight Onto d) Alpha Over

5. What is the correct way to insert a rotate layer?

   a) New Layer > Gradients > Curve Gradient b) New Layer > Transform > Rotate

   c) New Layer > Transform > Scale d) New Layer > Transform > Translate

B. State *true* or *false*.

1. A layer represents a particular object in Synfig.
2. It is not possible to delete a layer once added.
3. The 'Create a outline layer' option is used to create a path with no fill area.
4. You can group as many layers as you want in Synfig.
5. After grouping layers, you can change the properties of an individual layer.

C. Fill in the blanks.

1. The feature that is used to hide and show objects again is called _____.
2. The rotate layer must be added to the _____layer.
3. Every element and object has its own _____ in Synfig.
4. The _____ blend method is used to apply the gradient effect.
5. The _____ layer is used to move an object on a specified path.

D. Answer the following questions.

1. What is the need for grouping different layers? Explain with the steps.
2. Write the steps to apply a gradient effect to a circle.
3. How will you import an image?
4. Write the steps to rename a layer.
5. How will you mask an object?

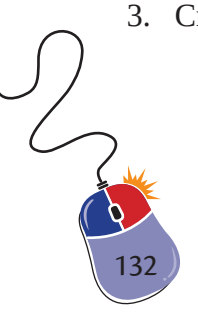
Application-based Questions

1. Manas is trying to apply the gradient effect on a circle, but every time he does that it applies to the whole canvas. Suggest him how to fix this issue with appropriate steps.
2. Number the steps in the correct order to move an object on a specified path.

☐	Import an image into the canvas.
☐	Add a new rotate layer.
☐	Turn on the animation editing mode and add keyframes.
☐	Keeping the Ctrl key pressed, select the blue duck of the rotation layer, and then select the spline layer.
☐	Group the rotate and the image layer together.
☐	Right-click on the path on the canvas and select the Link to Spline option.
☐	Select both the rotate and image layers and bring the layers handles near one another.

Lab Activity

1. Show an animation of birds flying in the sky.
2. Create an animation to show the sun hiding in the clouds and then appearing again.
3. Create an animation to depict the movement of planets around the sun.



Project

Remember the collision theory that you have studied in chemistry. Prepare an animation showing the collision of the particles, and present it in your chemistry class.

Explore More

- Find out some more open-source and proprietary software to create animations.
- Find out about the ‘gif’ files. How can you export your animation as a ‘gif’ file?

Work Wisely

Try and learn as many tricks in animation as you can using Synfig.

Weblinks

- https://www.synfig.org
- https://www.synfig.org/cms/en/download/
- https://en.wikipedia.org/wiki/Synfig

Notes for the Teacher

- Explain the significance of layers to the students.
- Demonstrate the steps clearly to help children learn the basic concepts of animation.

10 Ensuring Cybersafety

After going through this chapter, you will be able to—

- **understand** what cybercrime is;
- **recognize** major categories of cybercrime;
- **distinguish** between virus, e-mail/SMS spoofing, and carding;
- **differentiate** between hackers and crackers; and
- **know** how to ensure cyber security.

Ramu is a senior clerk working in a multinational company. One day, he receives an email. The email is shown below:

From: information Desk <info@allindlotteryforu.com>

Subject: ASILDS / All State Infrastructural Lottery Development Society fund raiser

Congratulations!

You have won a sum of $10,000,000 in a lottery raised by the ASILDS lottery committee. You have been chosen from a population of 1,296,834,042 people living in your country.

To claim your prize, please contact our agent in Narnavasi, India.

Contact person: Mr Hector Visillis

E-mail: hector_visillis@allindlotteryforu.com

Phone: +343345 23443 34435

Ramu is overjoyed. He shares this news with his wife. His wife starts dreaming of a new bungalow, a luxury car, and lots of jewellery. The next day, Ramu goes to his office with a box of sweets to share with his colleagues. Firstly, he shares the sweets with his best friend Shyam, who is a software engineer.

'Hey, why are you distributing sweets?' Shyam asks.

'I won a lottery in an email!' Ramu replies.

On listening to the reason behind the celebration, Shyam grows suspicious and asks Ramu to show him the email. On reading it, Shyam was sure that it was a fraudulent email.

'Have you contacted the contact person in the email?' asks Shyam.

'I didn't. I have not thought of it,' Ramu replies.

'Thank God you have not gone any further. It is not actually a lottery, but a spam message meant to cheat you. It is all a part of cybercrime,' Shyam says.

'Cybercrime? What is that?' asks Ramu.

Shyam then tells Ramu about cybercrime and how widespread it is today.

Cybercrime

Computers and the internet have made our lives easy, bringing many benefits for us but with problems. Cybercrime is one of such problems.

Any offence that is committed using a computer, the internet, or a hardware device is called **cybercrime**. Those who carry such type of activities are often termed as **cybercriminals**. Their main intention is to steal important information using different techniques. Crimes such as phishing, stealing bank credentials, bank robbery, illegal downloading, and industrial snooping are some of the most common cybercrimes.

Remember

Use a combination of letters, numbers, symbols, spaces, and capital letters to make a strong password.
Use different passwords for different purposes, such as emails, computers, and mobile phones.

Ramu doesn't know about all this. He requests Shyam to tell him more.

Shyam then tells Ramu about different categories of cybercrime as follows:

1. Cybercrime against an individual
2. Cybercrime against property
3. Cybercrime against an organization

Cybercrime Against an Individual

Cybercrime against an individual is one of the main categories of cybercrime. It involves any kind of violation of the privacy of an online user. It includes passing on someone's personal information, such as private photos or videos without permission, and harassing someone using emails, SMS, or fake online scams.
Shyam then describes some common examples of cybercrimes against individuals.

Quick Learn

Ask your elders if they have ever received emails or messages with subject line 'You have won $400xxxx lottery/a prize', without even participating in it? Ask them how they respond to such emails or messages.

Harassment via emails

Abusive or threatening mails along with attachments to harm a user psychologically is a distinct cybercrime known as cyber harassment.

Hacking

Hacking means unauthorized access to the computer system. A **hacker**, responsible for carrying out such act, is a person with an advanced knowledge of operating system and programming languages.

Hackers can be of different types. Some hackers, known as **white hat hackers**, do not have intentions to damage any data but have complete access to your computer. On the other hand, some hackers, **known as black hat hackers**, have intentions to gain unauthorized access and destroy vital data or violate your system integrity using remote machines. Any illegal intrusion into a computer or a network to steal personal or private data is called **cyber hacking**.

Quick Tip

Install a firewall on your system and make sure to keep your system updated with antivirus software.

E-mail/SMS spoofing

Some people send bogus mails or messages that are unwanted, unknown, or uninvited and misrepresents their origin. Such mails or messages are often aimed at stealing someone's identity and breach the security or privacy of the victim.

Remember

Never use other people's computer resources without permission or authorization.

Carding

Carding refers to online frauds related to bank details. Here, the criminals steal the victim's banking details, such as debit or credit card password, and withdraw money from the bank account of the victim.

Quick Tip

Always be cautious while opening attachments or links in the emails and the free apps such as games, ringtones, and so on. They might have hidden viruses or spam.

Assault by threat

It means threatening someone using the internet. Offenders use emails, photos, or videos to threat or harass people or their families.

Checkpoint

Fill in the blanks.

1. Any offence that is committed using a computer, the internet, or a hardware device is called _____.
2. A _____ is a person who has an advanced knowledge of operating system and programming languages.
3. _____ hackers never damage the data on your computer but have complete access to your computer.
4. _____ refers to online frauds related to bank details.

Cybercrime Against Property

'Do you know offences against all kinds of property using computer or the internet is also a kind of cybercrime?' Shyam asks.

Ramu has no idea what Shyam is telling him.

Shyam further explains it to Ramu.

Types of crimes such as vandalism, theft of corporate security or any secret information by a rival, and transmission of viruses or infected programs for harming one's property can be considered as cybercrimes against property.

Shyam then briefly describes these types of crimes.

Cyber vandalism

Cyber vandalism means destroying the data in a computer or cloud intentionally. In this case, the cybercriminal creates malevolent programs intended to harm the hard disk data or login credentials of the victim.

Cyber squatting

It means using a company's registered trademark, domain, or name to get benefitted. The main intention is to steal or misspell a domain name to get more earnings. Sometimes, some legal copyright and trademark holders forget to register their domain. This makes domain stealing easy for cyber squatters.

Remember

A virus can only spread either by opening an infected file or by an infected disk

Hacking computer systems

Hacking includes all kinds of unauthorized access to someone's computer system. It aims at stealing personal information or defaming someone or some organization.

Transmitting viruses

A virus is a program or a piece of code created by a programmer to damage or steal someone's personal information or modify data available in someone's computer.

One of the known computer viruses, Melissa, was transmitted to the victims' computer without their knowledge, and it spread by copying itself. The Melissa virus mainly affects data, files, and computer systems.

'Have you not heard of or read about trojan horses, worms, boot virus, and email virus in the news?' Shyam asks.

'Yes, I have heard of them,' replies Ramu.

Shyam then continues to tell more.

Did You Know?

Virus is an acronym for Vital Information Resources Under Seize.

Cyber trespass

Cyber Trespass means misuse, disrupt, or damage data or system intentionally without authorization. It is usually done wirelessly using networks like the internet.

Did You Know?

Melissa virus was released in 1999 to infect mainly Microsoft Word and Outlook-based documents.

Cybercrime Against Organizations

Today there are no organizations that are untouched by cybercrimes. For rapid growth, organizations always need to get connected with the internet. Cybercrime against organizations includes the threat of leaked confidential strategies and domain theft.

Shyam then describes the offences of cybercrime against organizations.

Remember

Without an antivirus software program, your installed software will be infected within minutes.

Unauthorized access over computer system

Every organization has its confidential records and data. Accessing, changing or deleting, or making copies of data without permission from the owner is an illegal activity.

Ownership of non-permitted information

It means keeping an authority's proprietary or confidential data without proper permissions.

Denial-of-Service attack (DoS)

Sometimes, the offender of cybercrime floods the internet server with fake requests that results in overloading of the server. The main purpose of the offender here is to make the network resource unavailable to its intended users or to crash the server with bulk requests.

Distribution of pirated software

Illegal copying of some purchased licensed software program for use by just one organization or an user is called piracy.

Checkpoint

Fill in the blanks.

1. _____ means destroying the data in a computer or network hard disk.
2. _____ is a program or a piece of code created by a programmer to damage or steal any personal information or modify data available in a computer.
3. _____ means using a company's registered trademark.
4. Changing or deleting or making copies of something without permission from the owner is an _____ activity.
5. The term 'DoS ' attack stands for _____.

Cybersecurity

On listening to this, Ramu is now scared of using the internet.

'Hey, don't worry. Carelessness can lead to trouble and there is something called cybersecurity. You must just be a little careful when online,' says Shyam.

'Do you know about cybersecurity?' Shyam asks.

'Yes, a little. It is some kind of security related with computers,' Ramu replies.

'OK…OK! Let's learn about it,' says Shyam.

Then Shyam explains cybersecurity to Ramu.

Cybersecurity is a technique designed for protecting computers, networks, data, and software from unauthorized access. It prevents unwanted threats from harming the computer network.

'Let me tell you about four measures you can take to secure yourself,' says Shyam.

Application Security

Application security covers the countermeasures to secure the application from threats. It includes auditing and logging, user authentication, session management, and input parameter-validation techniques.

Disaster Recovery

Disaster recovery works on the recovery strategies in case of a disaster. This ensures that any corporate office or organization has a concrete plan for disaster recovery.

Network Security

It includes solutions like intrusion prevention system, virtual private network (VPN), firewall, antivirus, and anti-spyware to use uninterrupted network connections. A firewall is considered as the first thing required to protect personal data. It can be applicable to both hardware and software or their combination. There are many options available in common firewall techniques, such as Application Gateway, Circuit-level Gateway, Packet Filter, and Proxy Server.

Information Security

Information security uses the technologies of identification, authentication, and authorization of user and cryptography to prevent identity theft and protect privacy.

Update System Regularly

Update system, applications, and network timely to prevent further interruptions or outer influences.

Remember

Never open the mails that claim that you have won a lottery or contest without having participated in it.

Quick Learn

Find out the differences between an antivirus and a firewall.

Key Terms

Cybercrime	Any offence committed using a computer, the internet, or a hardware device
Email spoofing	Emails sent to someone with false identity
Virus	A program or a piece of code created by a programmer to damage or steal any personal information or modify data available in a computer
Firewall	Firewall is a system that prohibits illegal admittance to a personal network
VPN	A private network arranged by using encryption over a pubic network
Cryptography	A process that converts the data or information into codes to keep confidential details a secret

Recap

- Cybercrime has three basic categories depending on which the act of crime is committed upon—against individual, property, and organization.
- A hacker can get unauthorized access to your computer.
- Carding refers to online frauds related to bank details.
- Cyber vandalism means destroying the data in a computer or network hard disk.
- A virus spreads by copying itself and affecting or corrupting the data, files, and the computer system.
- Cybersecurity is technology designed to protect the computers, networks, data and software from unauthorized access.
- Disaster recovery works on the recovery strategies in case of a disaster.

Exercise

A. Choose the correct options.

1. What should be used to protect a computer from a VIRUS attack?

   a) Recovery strategies b) Antivirus c) Firewall d) None of these

2. Which of the following viruses was released with the intention of infecting Outlook-based applications?

   a) ILOVEYOU b) Melissa c) Code Red d) None of these

3. Who among the following has no intention of damaging the data on one's computer but have complete access to the computer resources?

   a) Editor b) White hat hacker c) Cracker d) Black hat hacker

4. What do you understand by illegal copying of some purchased licensed software program?

   a) Hacking b) Piracy c) Spoofing d) Carding

5. Which of the following techniques can be used to store data in codes to keep it a secret?

   a) Cryptography b) Firewall c) Norton antivirus d) None of these

B. State *true* or *false*.

1. Stealing an authorized domain is illegal.
2. Application security measures are taken to secure the application from threats.
3. A firewall is known as the first step in protecting private information.
4. Cybersecurity cannot prevent threats from a network.
5. Virus is a program or a code that is created by a programmer with the intention of creating scientific tools.

C. Fill in the blanks.

1. _____ use many techniques to hack important information.
2. _____means destroying someone's property intentionally.
3. _____is the technology designed to protect the computers.
4. _____ virus spread through Microsoft Word documents.
5. Cyber harassment is a _____cybercrime.

D. Answer the following questions.

1. Explain cybercrime along with its different categories.
2. Describe cyber hacking.
3. What do you understand by e-mail spoofing?
4. Briefly explain cybersecurity. Mention some elements of cybersecurity.
5. What is a computer virus? How does it work?
6. Write the difference between a white hat hacker and cracker.

Application-based Questions

1. Riya wanted to download a song from a free website. She entered an unknown website, many pop-ups started appearing on her computer screen with some warnings. She immediately stopped using the network and closed the site. How will you explain to her to use safe websites as well as about network security?
2. Meenakshi does not want to renew her expired antivirus software. Explain to her the benefits of updating an antivirus and also about the hazards that may occur in case she doesn't renew the antivirus program.

Lab Activity

1. Open Firewall and Windows Defender, and 'Turn it on' to make sure both are working.
2. Check for the antivirus installed in the computers of your computer lab. Make a presentation on it, which must include the following:
   a) Developer
   b) Features
   c) Platforms available
   d) Merits or demerits

Project

1. A boot virus destroys or corrupts your data when you restart your computer. Find out more about this virus and its style of spreading. Share the information with your class in the form of a chart or a PowerPoint presentation.
2. Search the internet for different types of viruses. Make a list of these along with the remedies.
3. Search the internet and find out how antivirus software plays an important role in securing your data and personal information.

Work Wisely

- Always secure your hard disks from external hard disks to prevent others from meddling with your data without your permission.

- Keep a handy yet difficult password for your computer. Go to
  Control Panel ⟶ User Accounts ⟶ User Accounts ⟶ Manage Accounts ⟶ Change an Account ⟶ Create Password
- Create a password for your computer.
- Always create a separate backup for your system and application data. You can also create a regular backup through:
  Control Panel ⟶ System and Security ⟶ Backup and Restore

Weblinks

- https://www.netrixit.com/cyber-crime/
- https://www.entegrabank.com/cybercrime

Explore More

- Find out about recent cyberattacks and make a list of the loss caused during these attacks.
- There are several firewall techniques. Find out some common and effective techniques.
- Explore about the ‘Code Red’ computer virus.

Notes for the Teacher

- Share some information about cyber laws with students.
- Help students understand how to restore and backup Windows.

Worksheet 1

A. Choose the correct options.

1. Which of the following devices connects two LANs or two segments of the same LAN?

   a) Repeater b) Switch c) Gateway d) Bridge

2. Which of the following statements is correct about the primary key?

   a) A primary key can have duplicate values.

   b) A primary key cannot have duplicate values.

   c) A primary key can have only the numeric data type.

   d) None of these

3. Which of the following buttons will you click on to insert a selected field in the Selected Fields box while creating a query.

   a) >> b) < c) > d) <<

4. Which of the following properties is used to give an alternate text for an image?

   a) alt b) text c) alt_text d) alternate

5. Which of the following tools is used to mask an image?

   a) Move b) Line c) Spline d) Rotate

B. Fill in the blanks.

1. The _____ contains components of the operating system that will reside in the main memory of the system.

2. The _____ data type in Access is used to store date and time values.

3. A _____ is the memory area that stores the frequently used commands.

4. The _____ statement is used to exit from a function.

5. Online frauds related to bank details are called _____.

C. State *true* or *false*.

1. A field name cannot have a period.

2. The asterisk (*) repeats a string in Python.

3. To create a query, click on the Query Wizard button.
4. To rename a layer in GIMP, double-click on the name of the layer.
5. The loop property replays the audio again when it is finished.

D. Write the full forms for the following:

1. PAN
2. LAN
3. MAN
4. WAN
5. GPL

Worksheet 2

A. Choose the correct options.

1. Which of the following properties opens the linked document in the same window or tab?

   a) self b) parent c) blank d) top

2. Which of the following blend methods is used to apply the gradient effect?

   a) Onto b) Straight c) Composite d) Straight Onto

3. Which of the following tags is used to define a row in a table in HTML?

   a) `<tr>` b) `<td>` c) `<th>` d) `<table>`

4. Which of the following symbols is used to denote an escape sequence character?

   a) * b) / c) \ d) $

5. Which of the following devices is used to regenerate a signal and transmit it again?

   a) Router b) Repeater c) Switch d) Gateway

B. State *true* or *false*.

1. The islower() function returns True if a string has at least one character, and all characters are in lower case.
2. The Ctrl + I keyboard shortcut is used to import an image in Synfig.
3. A function begins the ‘def’ keyword.
4. A report in Access can be published as a PDF.
5. The reversed property is used to specify the numbering for the list items in the descending order.

C. Define the following terms:

1. Cybercrime
2. Hacking
3. Spoofing
4. Field
5. Record

D. Write a program using functions in Python to do the following:

1. Check whether a given number is divisible by 2 or not
2. Display all the even numbers between 10 and 50